

Operating Instruction of GHT7032-12 Topkit Tower Crane

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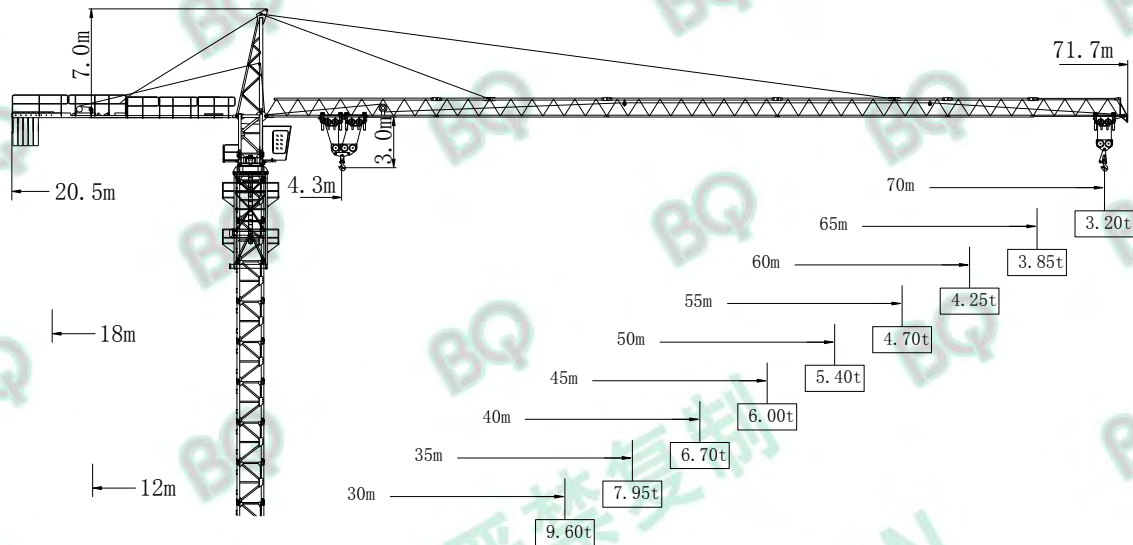
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Part I

I. Performance Parameter



机构特性 Mechanisms							Rope	Motor
	70RCS30	m/min	0~46	46~92	0~23	23~46	530m	51.5KW
		t	6.00	3.00	12.0	6.00		
◁□▷	120JXL	m/min	15-38-58					120Nm
	RCV185	r/min	0-0.7					2×185Nm
	RT443	m/min	12.5/25					4×1.7/3.4KW
Mains	380V/50HZ 90KVA							

载荷特性表 load diagrams

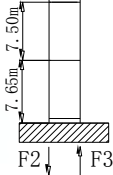
Jib m	倍率 Fall	R(Cmax) m	C(max) t	25	30	35	40	45	50	55	60	65	70
70	IV	21.4	12.0	10.0	8.00	6.50	6.00	4.75	4.15	3.55	3.15	2.75	2.45
	II	41.9	6.0	6.00	6.00	6.00	6.00	5.50	4.90	4.30	3.90	3.50	3.20
65	IV	22.8	12.0	10.8	8.70	7.20	6.10	5.05	4.55	3.95	3.45	3.10	
	II	44.7	6.0	6.00	6.00	6.00	6.00	5.80	5.30	4.70	4.20	3.85	
60	IV	22.8	12.0	10.8	8.70	7.20	6.10	5.05	4.55	3.95	3.45		
	II	44.7	6.0	6.00	6.00	6.00	6.00	5.80	5.30	4.70	4.25		
55	IV	22.8	12.0	10.8	8.70	7.20	6.10	5.05	4.55	3.95			
	II	44.7	6.0	6.00	6.00	6.00	6.00	5.80	5.30	4.70			
50	IV	23.3	12.0	11.1	8.90	7.40	6.20	6.00	5.10				
	II	45.7	6.00	6.00	6.00	6.00	6.00	6.00	5.40				
45	IV	23.8	12.0	11.3	8.90	7.60	6.40	6.00					
	II	45.0	6.00	6.00	6.00	6.00	6.00	6.00					
40	IV	24.7	12.0	11.8	9.50	7.90	6.70						
	II	40.0	6.00	6.00	6.00	6.00	6.00						
35	IV	24.8	12.0	11.9	9.60	7.95							
	II	35.0	6.00	6.00	6.00	6.00							
30	IV	24.9	12.0	11.9	9.60								
	II	30.0	6.00	6.00	6.00								

塔身 Mast $\square 2\text{m} \times 2\text{m}$ 反力 Reactions

固定式 Stationary

H (m)

12	52.5
11	49.5
10	46.5
9	43.5
8	40.5
7	37.5
6	34.5
5	31.5
4	28.5
3	25.5
2	22.5
1	19.5

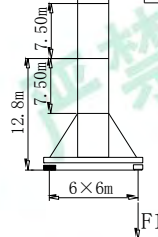


F2	● 148t	■ 147t
F3	● 90t	■ 97t
	▲ 75t	

行走式 Travelling

H (m)

12	57.6
11	54.6
10	51.6
9	48.6
8	45.6
7	42.6
6	39.6
5	36.6
4	33.6
3	30.6
2	27.6
1	24.6



F1	● 99t	■ 98t
	▲ 88t	

内爬式 Climbing

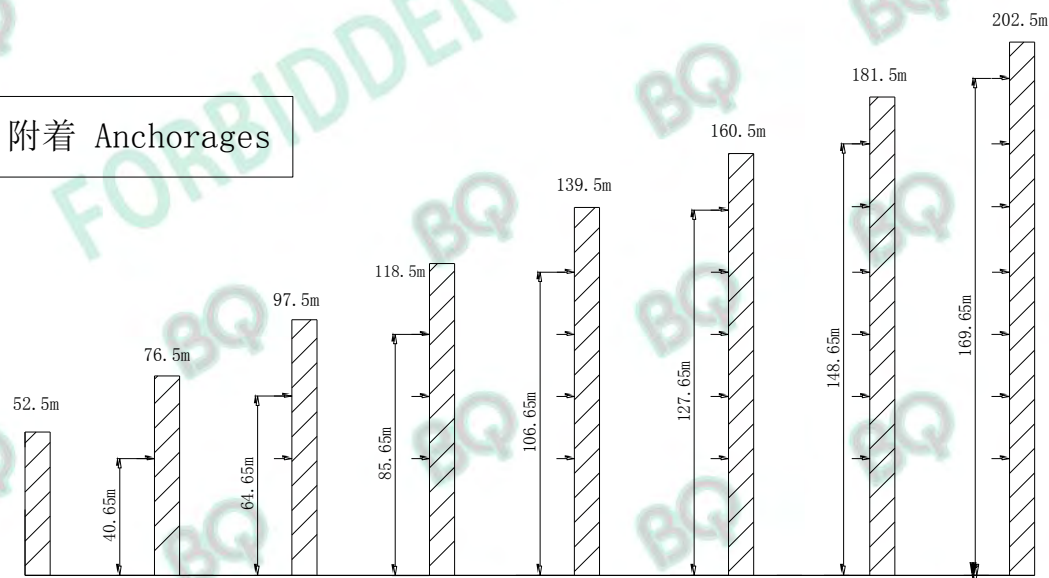
H (m)

12	38.9
11	35.9
10	32.9
9	29.9
8	26.9
7	23.9
6	20.9
5	17.9
4	14.9
3	11.9
2	8.9
1	5.9



- : 工作状态 In service
- : 非工作状态 Out of service
- ▲: 无吊载、无配重、最长起重臂和最大高度时的自重
Without load and ballast with longest jib and maximum height

附着 Anchorages



II General Rules for Installation

1 Introduction

This method of installation can install the crane to jacking position or operation status as quickly as possible.

An auxiliary auto-crane of which the hoisting characteristics must meet demands of hoisting crane parts is required for this installation.

In order to minimize service time of the auto-crane, the installation procedures, installation personnel, channels and assembly site etc. shall be well coordinated.

Electric power is not required before crane jacking.

This chapter is to make you be familiar with the whole installation process of the crane. Specific installation steps will be described in other documents.

1.1 General Rules for Installation

- Hoisting operation shall be carried out under safety condition, especially:
 - Solid foundation
 - No over load operation is allowed
 - Hoist cable with proper diameter and in good condition shall be selected according to part to be hoisted.
 - Hoist at specified hoist points.
- Installation can be performed only when wind speed is lower than 69km/h.
- Installation operation must be as per the sequence instructed.
- Remember to install and use protection and safety facilities, such as ladder, platform and safety wire rope.
- Crane hoisting is strictly prohibited before ballasts are installed on balance arm.

Note: requirements on ballasts of the balance arm specified according to the balance arm length must be abided by strictly. For crane located on chassis or cross beam, the ballast shall be in line with height to be achieved under the hook. In case of partial ballast, the ballast value shall be in line with mounting height of the crane and no less than minimum value listed in Ballast Table in Chapter 22A.

- Strictly follow “Special Provision” and “Instruction” in each chapter.

- For cranes operating under special conditions, “Special Provision” in Chapter of “Special Performance” must be conformed to.

- Such provisions are applicable to:

- Crane installation
- Crane heightening
- Crane removal

Should any special problems arise during installation, please contact Sales Department of our company.

Note: each crane has different model, type and optional parts (2X-rate/4X-rate trolley, double trolley and auxiliary hanger...), and drawings used in pages below are certain shapes which the crane may have. If a certain function of the crane is illustrated only, it will be delineated in grey.

1.2 Installation of “V-shaped” cotter pin

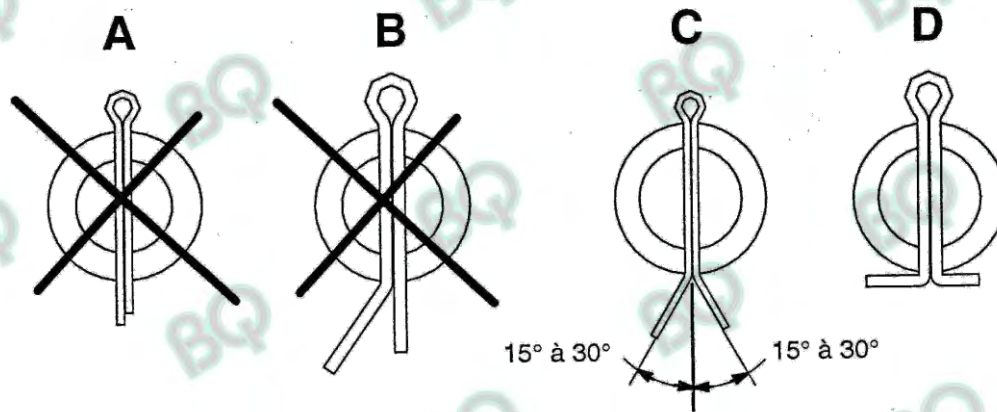
- In order to guarantee retention effect of the cotter pin toward shaft pin, in stead of the long leg, bolt legs of the cotter pin shall be bent (Detail Drawing B).

- It is not necessary to bend both legs of the cotter pin till they contact with the shaft pin, only bend for $15^{\circ} \sim 30^{\circ}$ is enough (Detail Drawing C). This facilitates convenience to take out the cotter pin when remove the shaft pin.

- However, pay attention and do not let legs of the cotter pin block onto other obstacles, which will deform or damage them when the shaft pin rotates.

- In case of obstacles, flatten both legs of the cotter pin completely (Detail Drawing D).

Note: use new or good-condition cotter pins.



2 Selection of Crane Performance.

There are many ways to install the crane. The crane performance shall be determined according to its installation method and the basic performance is determined by the following factors:

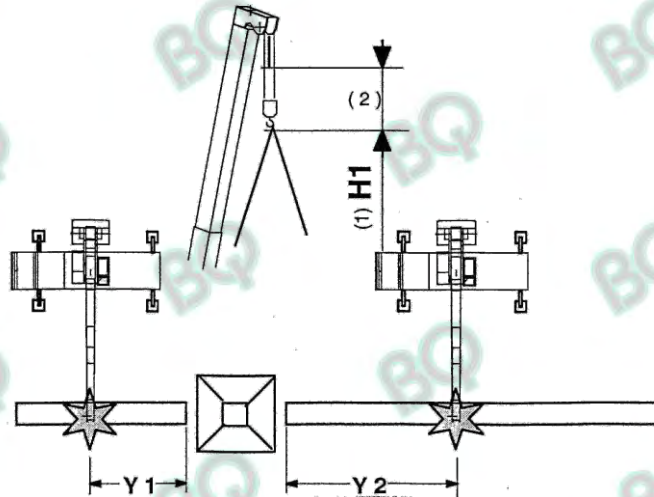
- Hoisting depth of the longest jib.
- Weight of the longest jib.
- The distance to slewing center line of the auto-crane is 10m at least.

Height (H1) below hook of the auto-crane is equal to height (H2) below hook of the crane to be installed plus different hoisting parts Xm. Height H2 is provided by bearing surface of the crane on the ground.

- X=11.1m: installation of tower cap and jib of 30-40m.
- X=14.3m: installation of tower cap and jib of 40-70m.

Note: if working surface of the auto-crane is not in line with plane surface at installation site of the crane, or there is special limit at the working site, adjust height and amplitude of the auto-crane to determine its performance correctly.

- Position of the auto-crane.
 - For long part, e.g. jib and balance arm, it is preferential to place the auto-crane a proper position in the working site and perpendicular to its center of gravity (bearing of the auto-crane on the ground).



(1) H1 shall be not obtained at upstroke limit of the auto-crane.

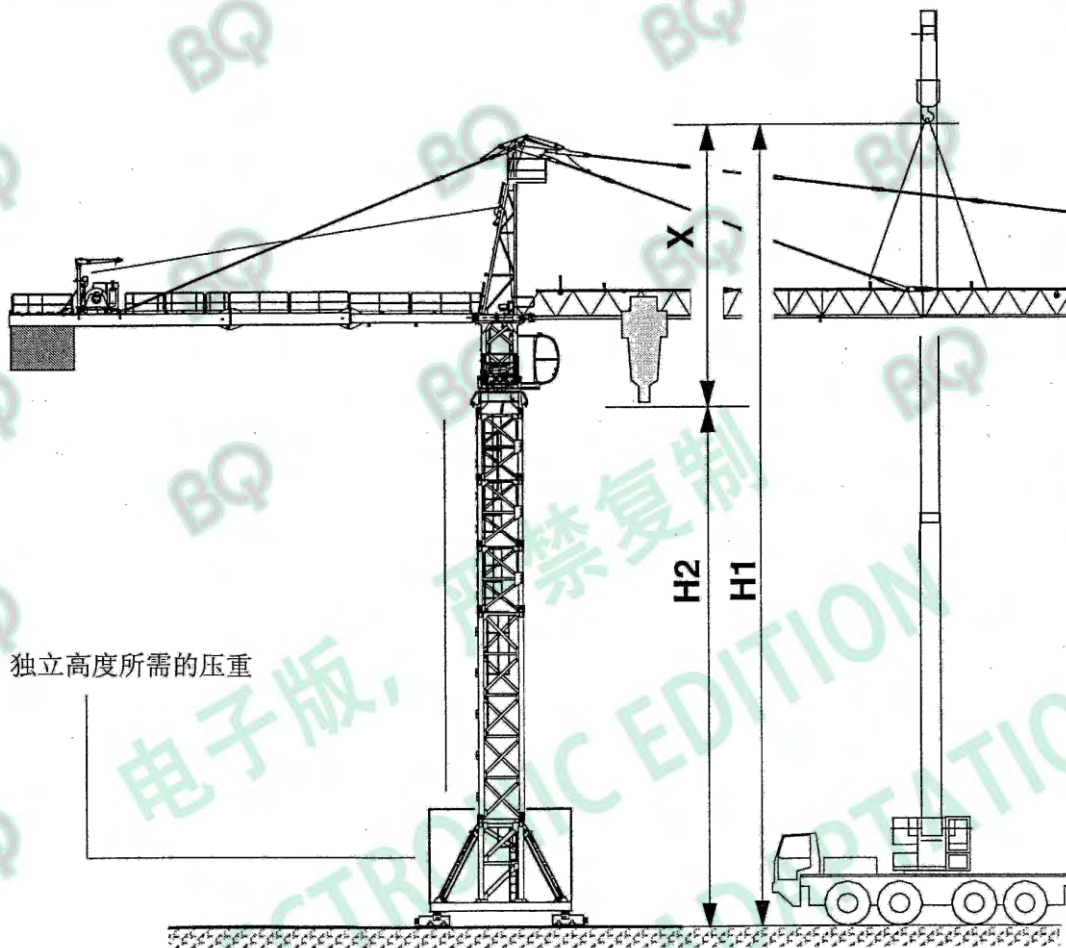
(2) The stroke is 1m at least.

Y1: gravity center of the balance arm.

Y2: gravity center of the jib.

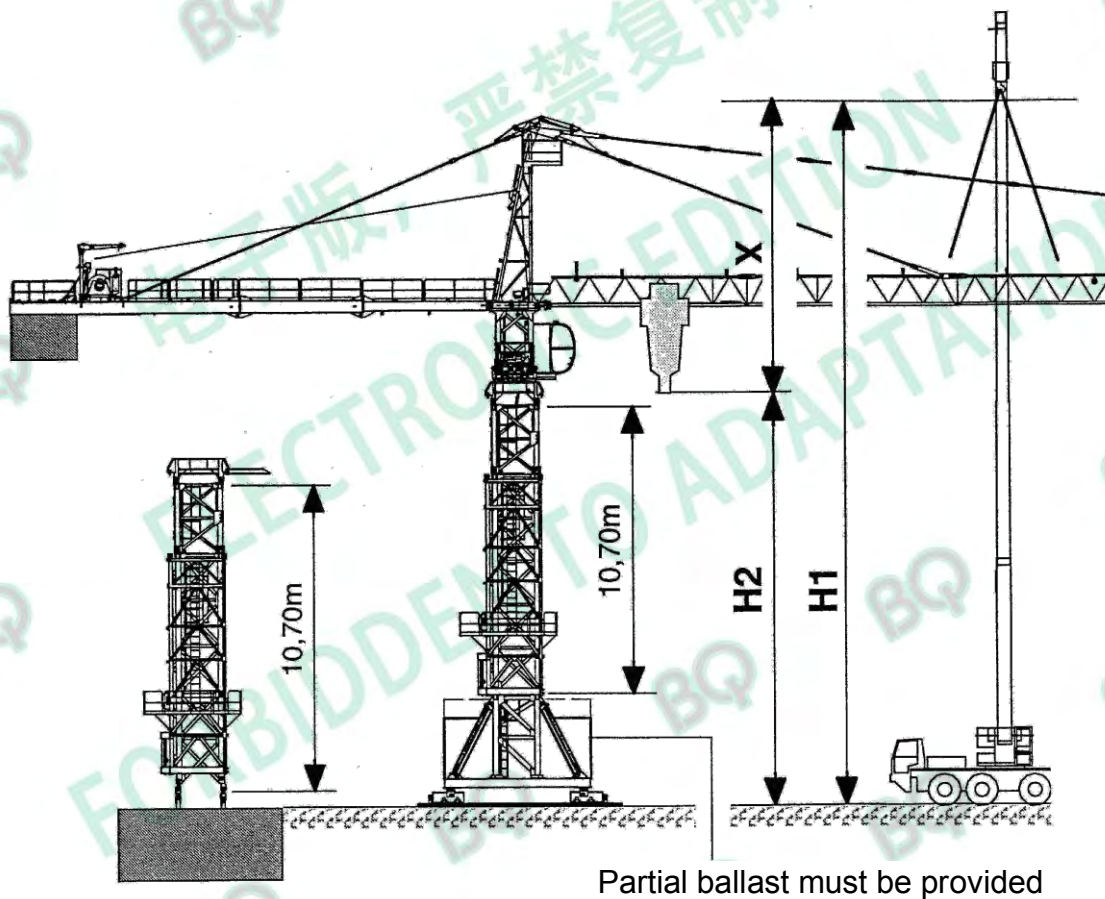
2.1 Selection and Installation

The crane can be installed to its independent height by auto-crane and such installation can use masts of different lengths, with or without jacking steps. The only standard for use is strength.



2.2 Jacking Installation

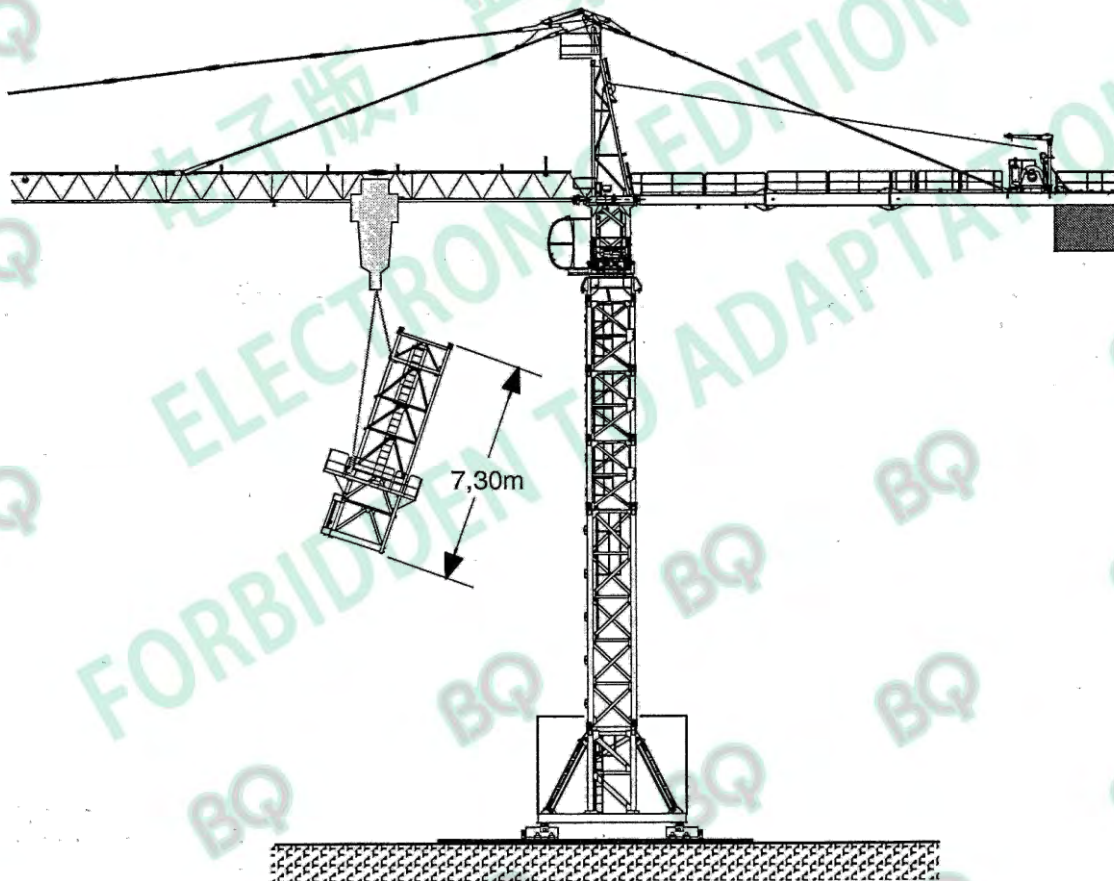
- For jacking installation, place the jacking frame at proper position by using the auto-crane:
- Install the crane at a low height and insert the jacking frame from upper direction of the mast, and then lift several 3m mast sections with steps to make the crane achieve its independent height.



- For jacking installation, place the jacking frame at proper position by using the crane:

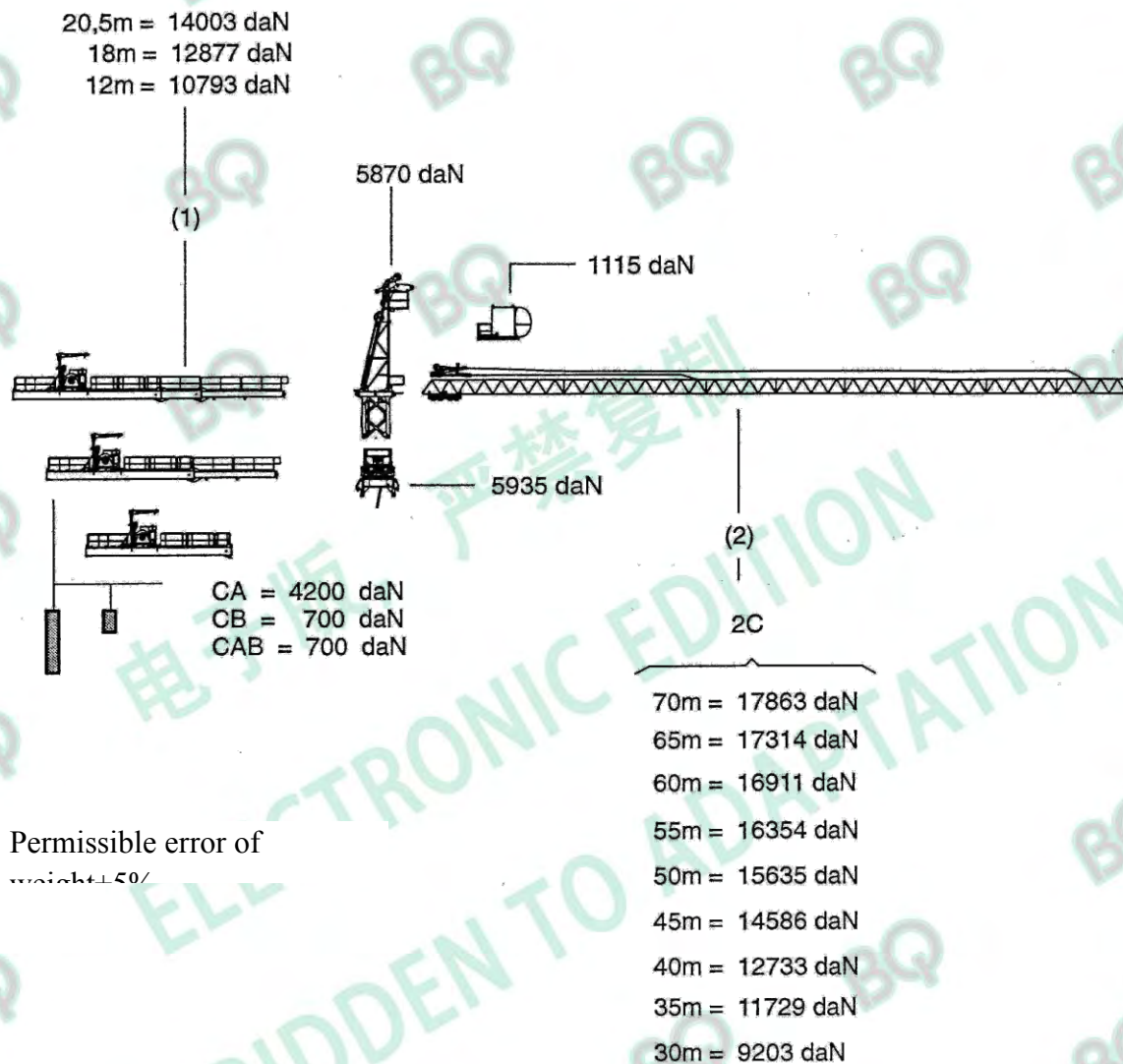
- Install the crane at a low height and use the crane to install the jacking frame on the mast in side direction, and then lift several 3m mast sections with steps to make the crane achieve its independent height.

Note: large space is required when install the jacking frame through the crane; therefore, height performance of the auto-crane shall be adjusted when selecting and placing mast sections with the auto-crane.



2.3 Weight of Main Package Units

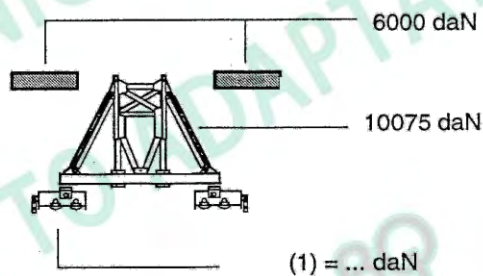
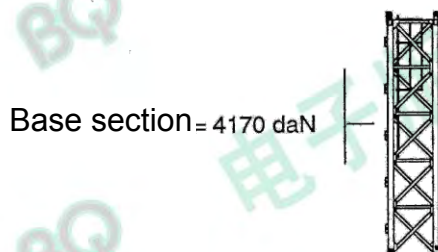
12t rotating part



(1) The weight includes guardrail, wind shield, brand plate, hoisting machine and wire rope, pull rod and auxiliary hoisting machine as well as hanger.

(2) The weight includes jib, luffing hoisting machine and wire rope, trolley at jib root, wind shield and pull rod on chord on the jib. Safety wire rope, excluding hoisting wire rope.

2.3 Foundation Parts



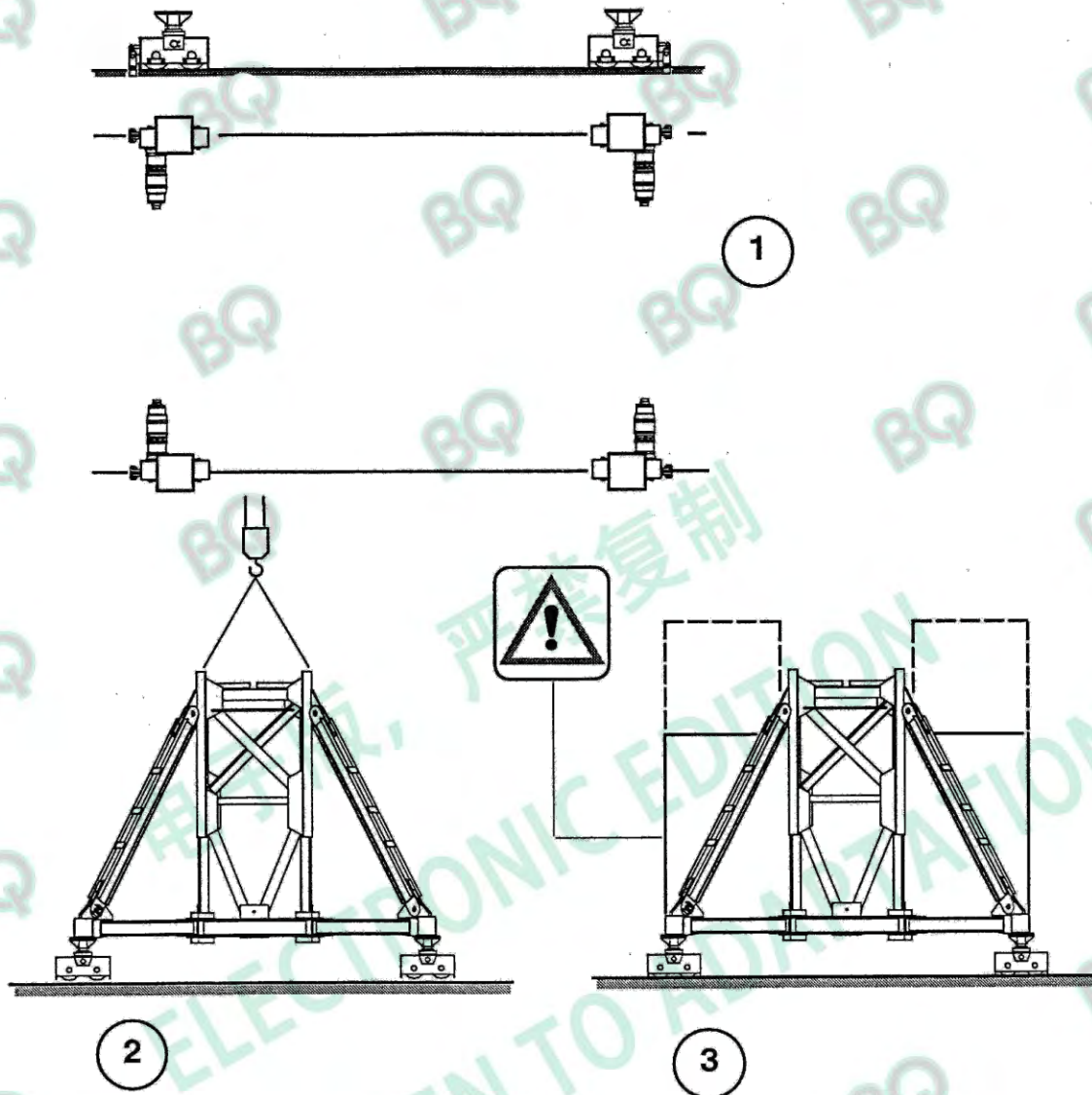
Permissible error of weight $\pm 5\%$

(1) = 1 个主动台车

3 Installation Diagram

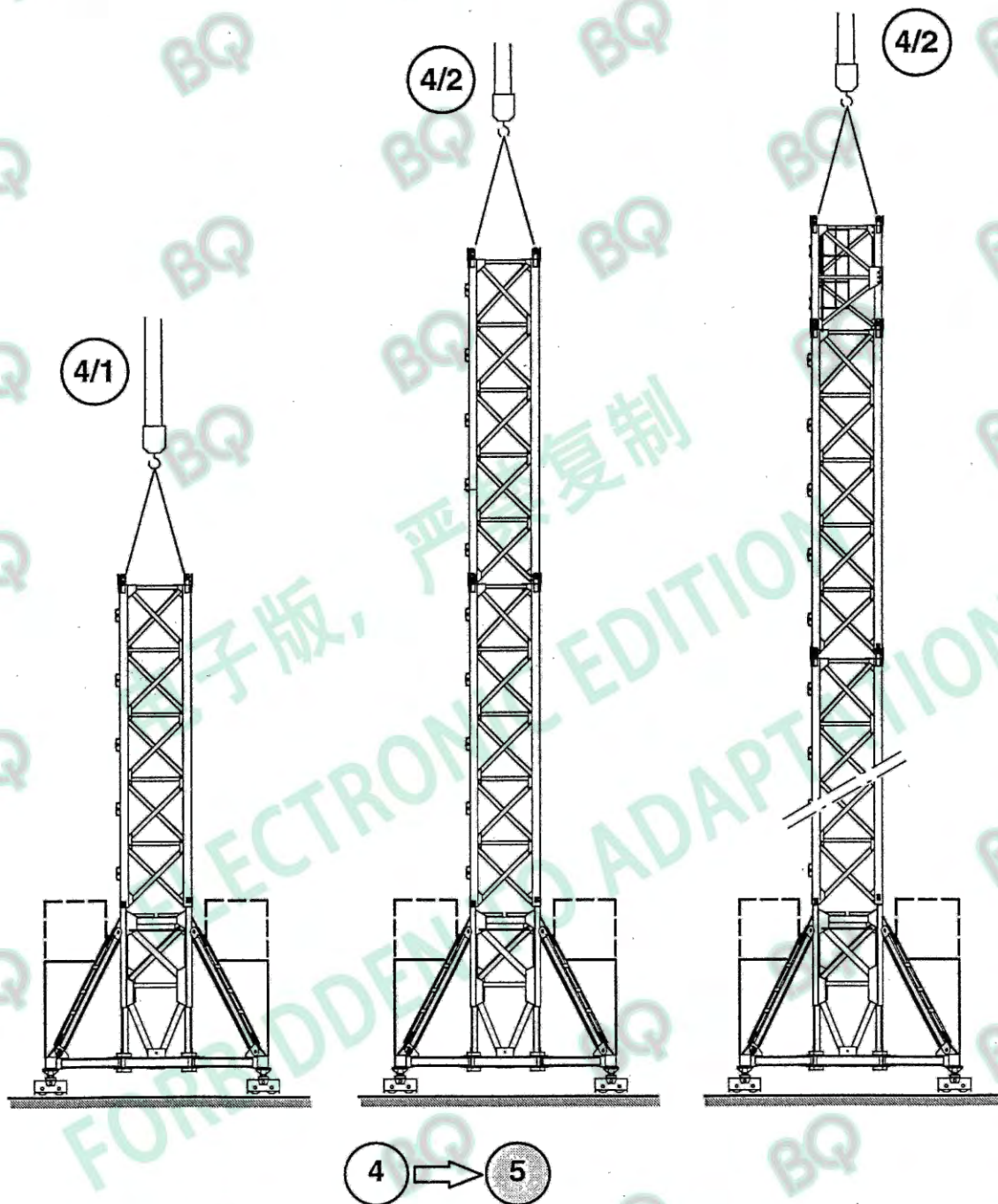
Remember: the crane installation shall be carried out in sequence given in pages below.

3.1 Installation of Traveling Foundation Parts



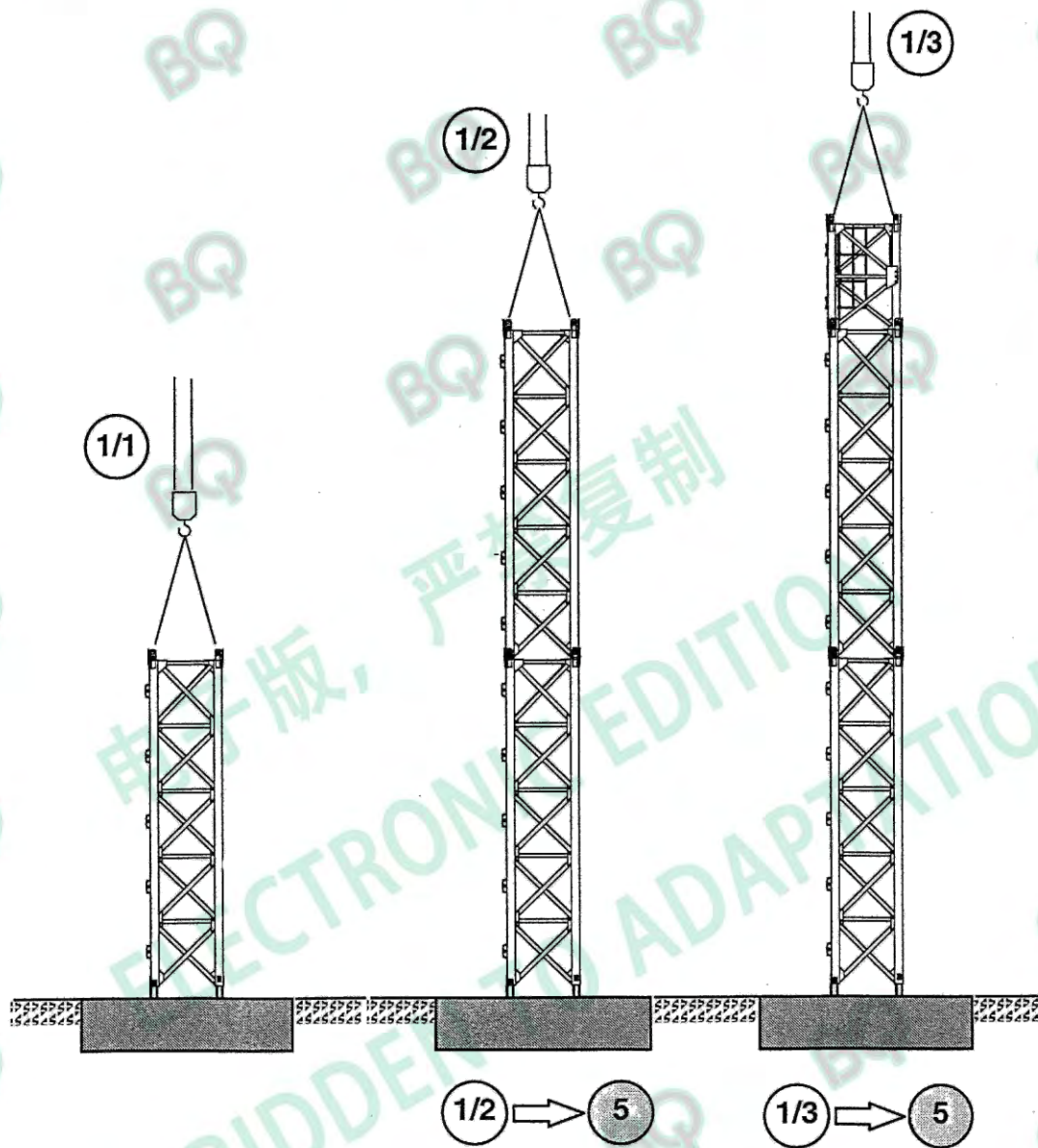
 Ballast must be provided

 General installation rules



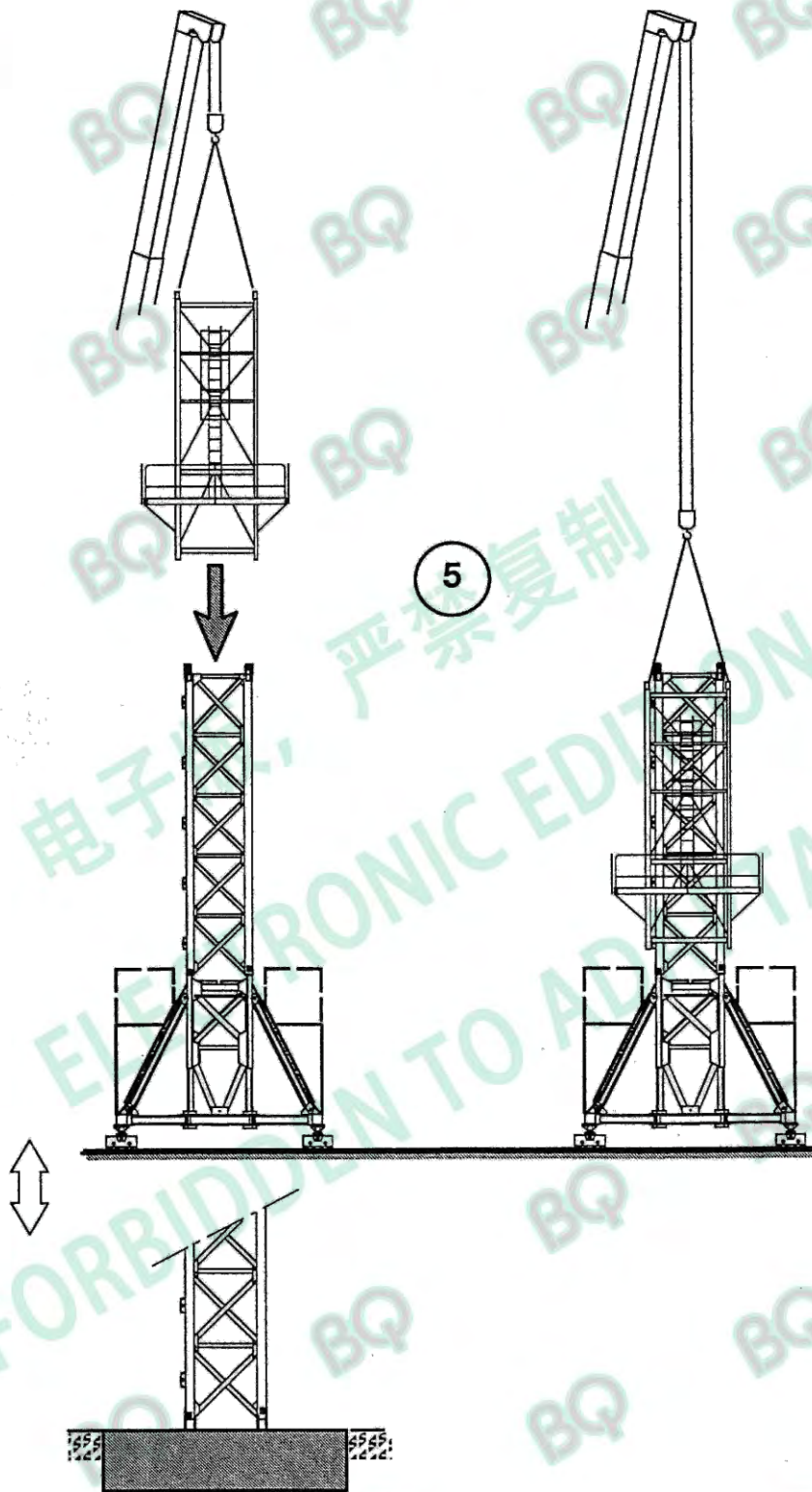
Note: quantity of mast sections depend on the length and placing method of the jacking frame selected.

3.2 Installation of Stationary Foundation Parts

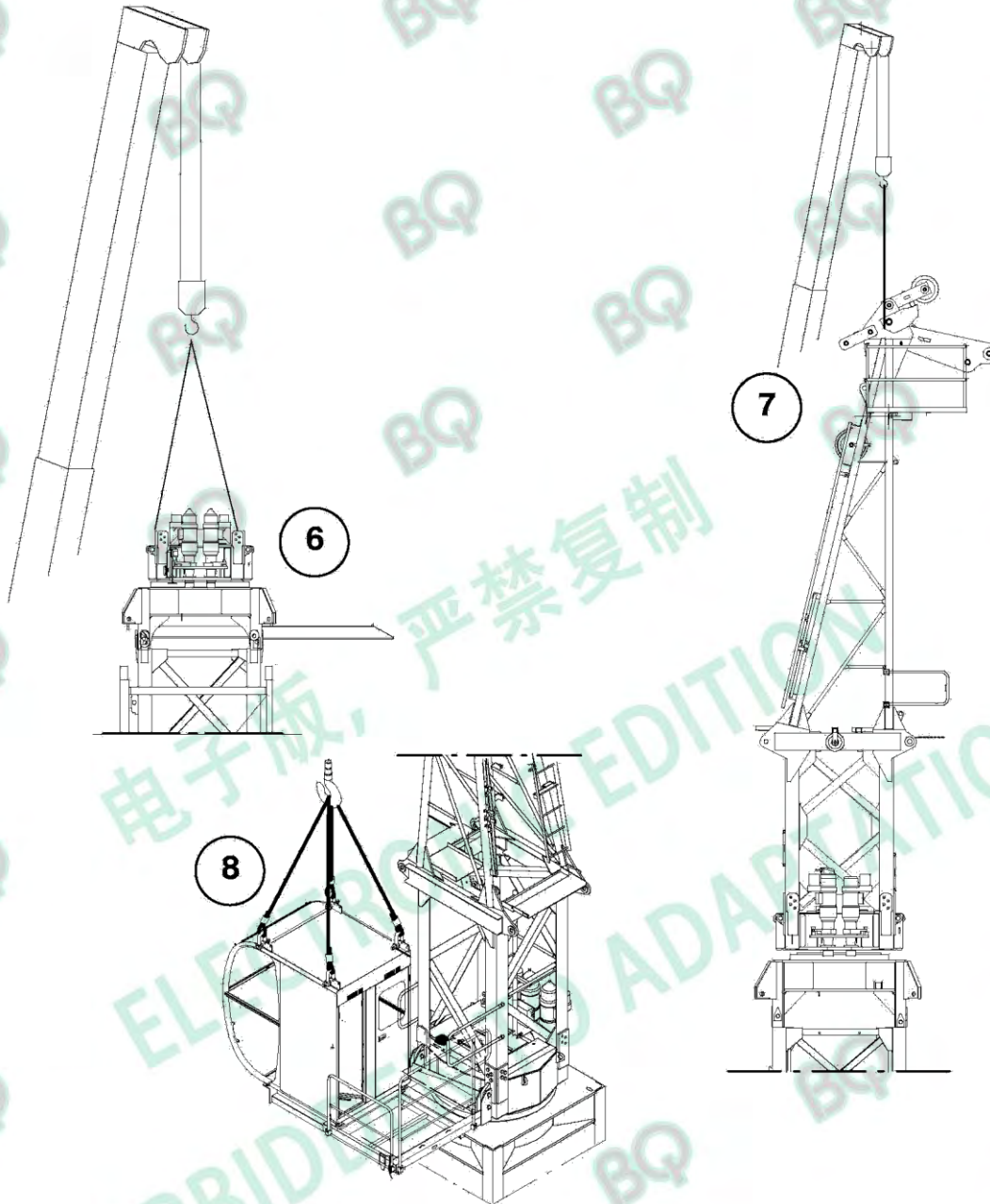


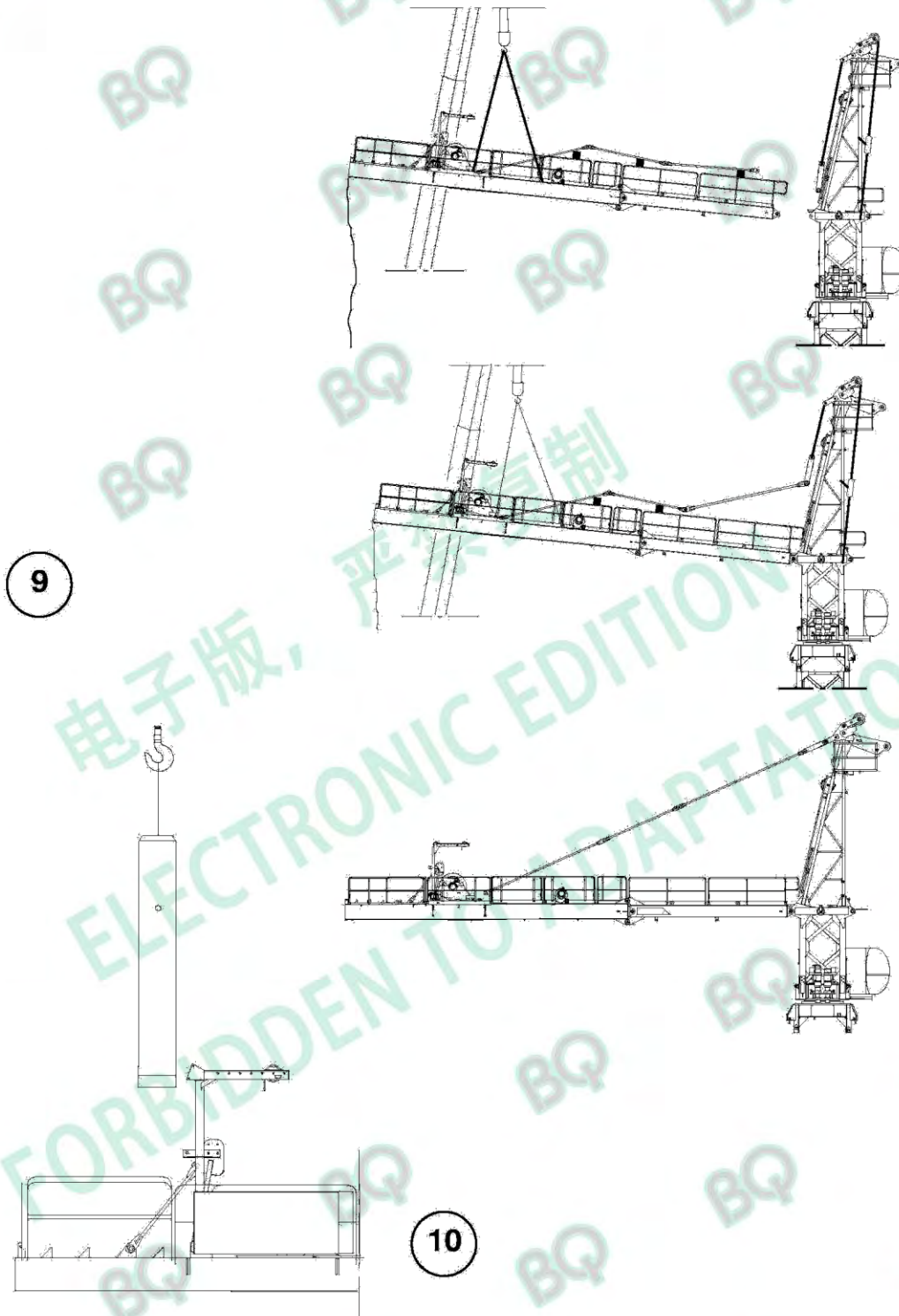
Note: quantity of mast sections depend on the length and placing method of the jacking frame selected.

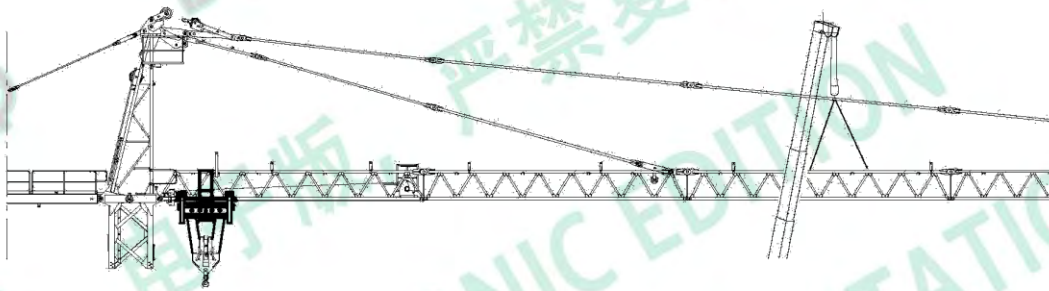
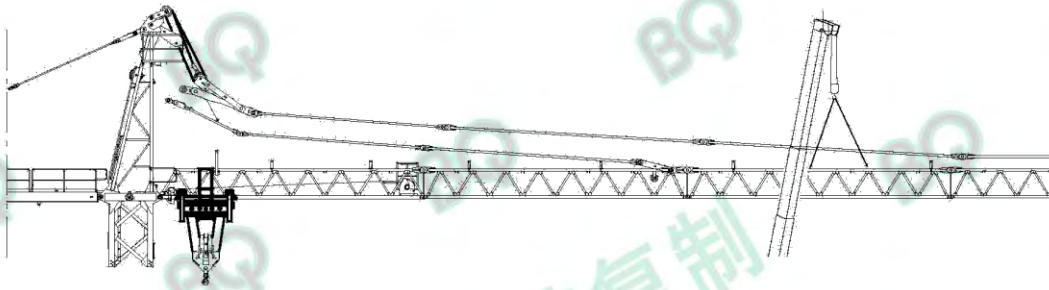
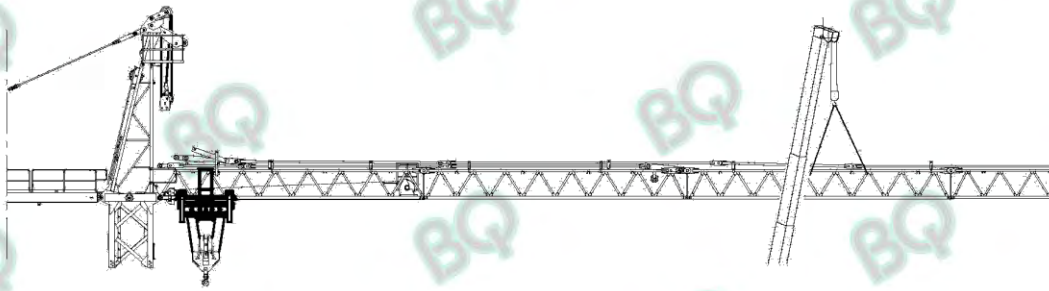
Installation of foundation parts (continued)



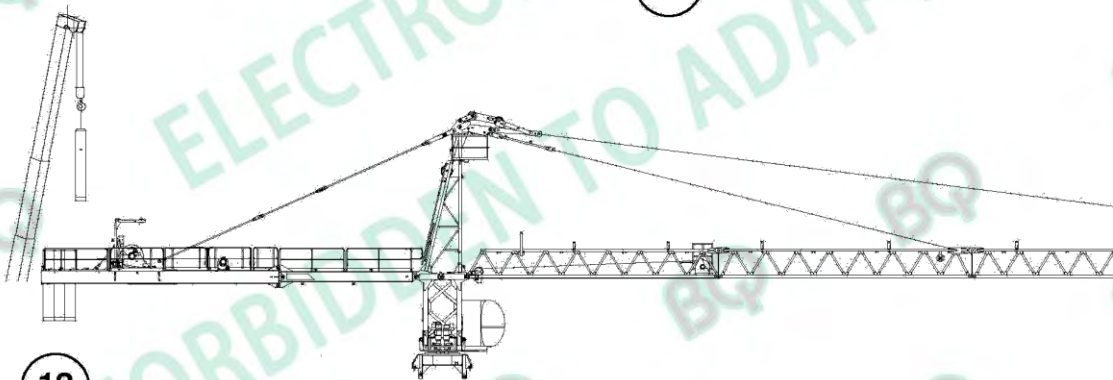
Installation of Rotating Part







11



12

13

III Track

1 Track Selection

The following factors shall be considered for track size:

1) Tower crane, which determine:

- Clearance and bending radius of the track.
- Reaction under each bogie determined by service height of the crane.

2) According to service conditions of the crane, sometimes, a anchorage cement foundation out of service must be equipped.

3) Ground:

Uniformity and non-uniformity of the strength.

4) There are two types of track:

- Cement track
- Wood track

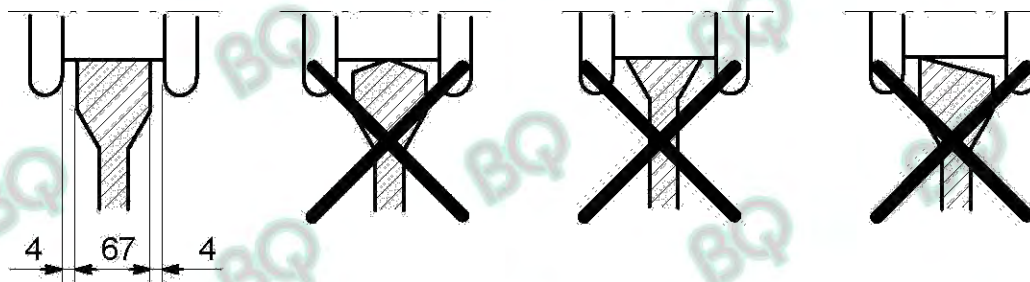
2 Track Laying

1) Railway track used

The railway track shall have its contour compatible with the bearing wheel, and the maximum rim width is 67 mm. Track subject to slight friction is preferential for its good bearing surface. Standard materials (railway track and accessories) is preferred.

The crane users shall make sure that size characteristics of the railway track conform to connection and maximum vertical or horizontal reaction of the railway track and wooden sleeper.

The horizontal reaction is about 10% of the vertical reaction.



Ok

new track

excessively worn track

one-side worn track

2) Track Laying

The crane track shall be designed and laid carefully as below:

- Laid horizontally (both in longitudinal and lateral directions).
- Installed on solid foundations.
- Laid flat and parallel absolutely.
- Use railway rail of the same type over the full length.
- Stoppers shall be installed at 1m from track ends.
- Earth correctly.
- For crane installation, it is necessary to make sure that the track length is no less than two times of axle distance of the chassis.

Note:

Diagrams below are given as an indication only. It exclusively applies to a homogeneous soil with a resistance of at least 20N/cm^2 . The crane users shall be responsible for laying tracks and tracks are required to resist maximum trolley reaction without local subsidence.

The track foundation determines normal operation and stability of the tower crane. Therefore, structure and tolerance of each foundation must be paid attention to.

Track tolerance for cranes at construction site

1	Average track size (L)
2	Track mounting plane ** = measuring length of the size shall not exceed 2m.
3	Track levelness (slope) ** = measuring length of the size shall not exceed 2m.
4	Levelness of one track relative to another track (transverse slope).
5	Inclination of one track relative to another track (cross).
6	Position of one stopper relative to another stopper.
7	Inclination of rolling surface at the track head relative to horizontal plane.

1	Theoretical average track Max. $L = L + A$ Min. $L = L - A$	$L < 15\text{m} : A = \pm 5\text{mm}$ $L > 15\text{m} : A = \pm [5 + 0,25(L-15)] \text{ mm}$ with L (m)
2	2000 b $+B$ $-B$	$B = \pm 10\text{mm}$ $b = \pm 1\text{mm}^{**}$
3	2000 $+C$ c Operational height $-C$	$C = \pm 10\text{mm}$ $c = \pm 2\text{mm}^{**}$
4	L D	$D = \pm 1\text{‰} \times L$ Max. $\pm 10\text{mm}$
5	$A2$ $B1$ $A1$ $B2$ $+$ $-$ $E = \text{inclination } A1 \text{ } B1 - \text{Beam } 1$ $E = \text{inclination } A2 \text{ } B2 - \text{Beam } 2$	$E = 0,5\text{‰}$
6	L F	$F = \pm 1\text{‰} \text{ of } L$ Max. $\pm 20\text{mm}$
7	G K	$G = \pm 8\text{‰} \times \text{width of the track head}$

3) Accessories at track ends

Stoppers at track ends

At the track ends, the crane shall stop traveling before touch safety devices.

Such safety devices are not operating mechanisms. There are three types of safety device as shown in drawing below:

- 1) Travel limit switch
- 2) Elastic retainer (buffer)
- 3) Fixed retainer welded on tracks

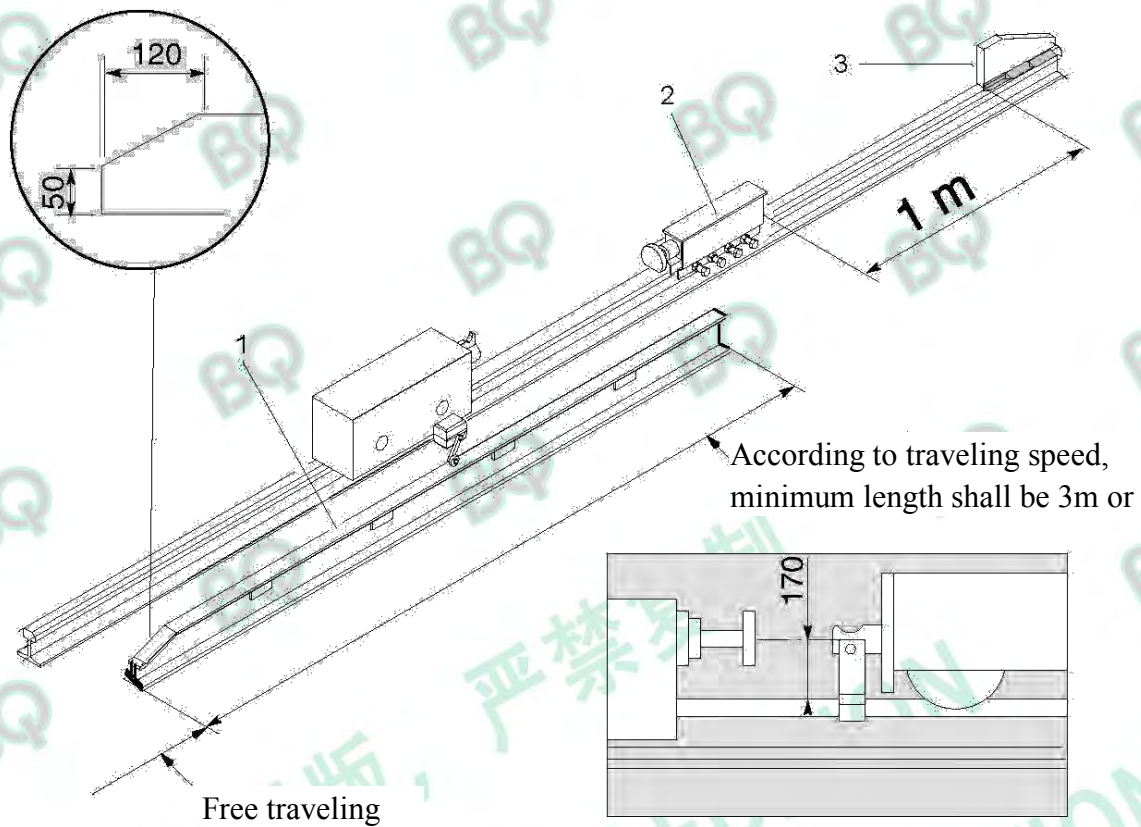
All of them are devices designated by security sectors; pay special attention to their fabrication and installation, and check their working performance periodically.

Installation of device (1) is described in relevant chapters and sections of its manual; make sure that wedges are parallel to the steel rail so that limit switch won't slide from the wedge when rolling on the rail. Devices (1), (2) and (3) are provided and installed by customers themselves. Device (2) can be fixed on the rail by an attaching clamp of which different models is available from professional suppliers.

When selecting such safety devices, the crane weight (buffering power) and height of buffer blocks shall be taken into consideration, and height of buffer blocks shall be the same as height of the retainers on the crane trolley.

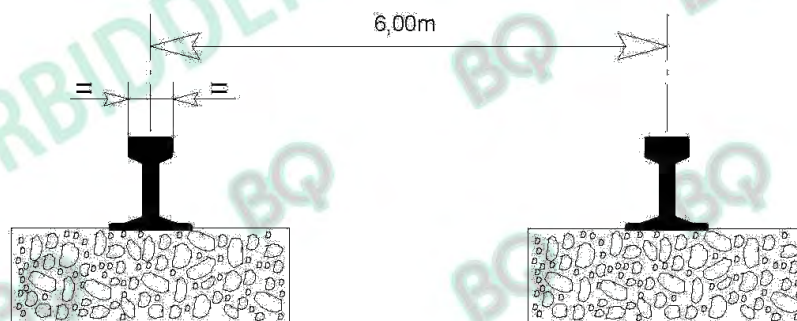
Device (3) shall be welded on the rail with proper size to avoid derail at rail ends. Diagram below is a schematic plan only.

Note: each end of the track shall be installed with two retainers, of which the location shall be accurate so that both of them can function at the same time.



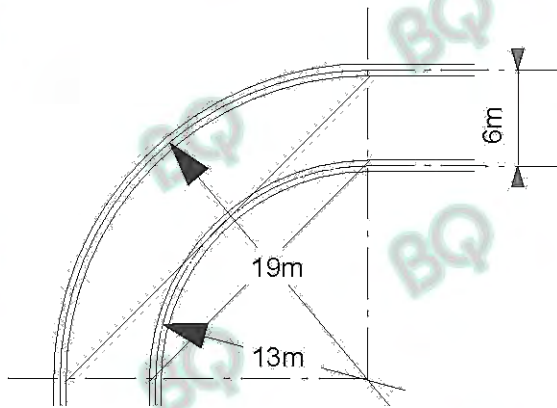
4) Track width and bending radius of 6m chassis

① Straight track



② Chassis with slide bogie

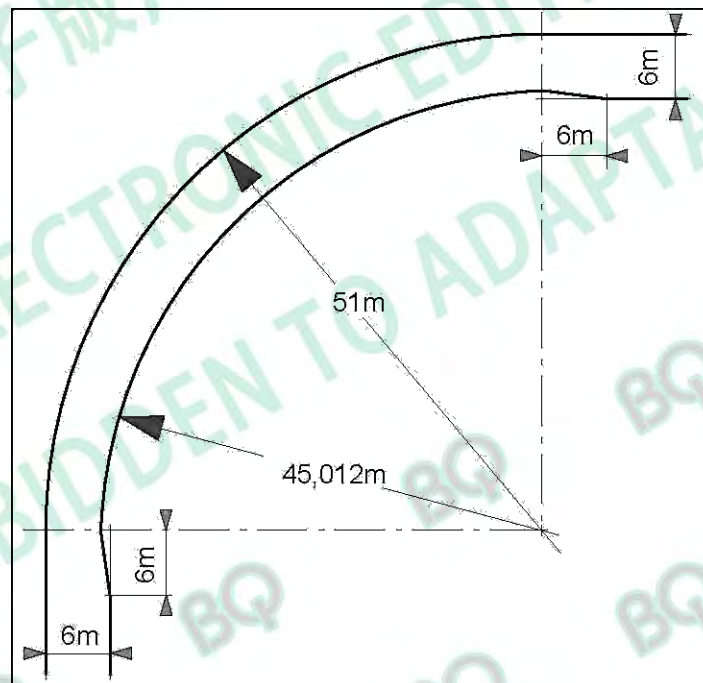
Minimum radius of the 6m chassis with slide bogie is specified in drawing below.



③ Chassis without slide bogie

Minimum radius of the 6m chassis without slide bogie is specified in drawing below.

Connection of normal straight track and narrow track can be done only on inner side track.



5) Track on cement sleeper

Description and signs

3 HA 10×1100 e : 15 (example)

3 : bar quantity

HA : deformed steel bar

10 : bar diameter (mm)

1100: bar length (cm)

e : clearance (cm)

L.B.: lower layer

L.B.n°1: first layer below

L.B.n°2: second layer below

L.H. : upper layer

Z.N. : Inter layer

A.H.B. : bar

L.R. = 45t: sleeper used in vertical direction and with maximum reaction of 45T

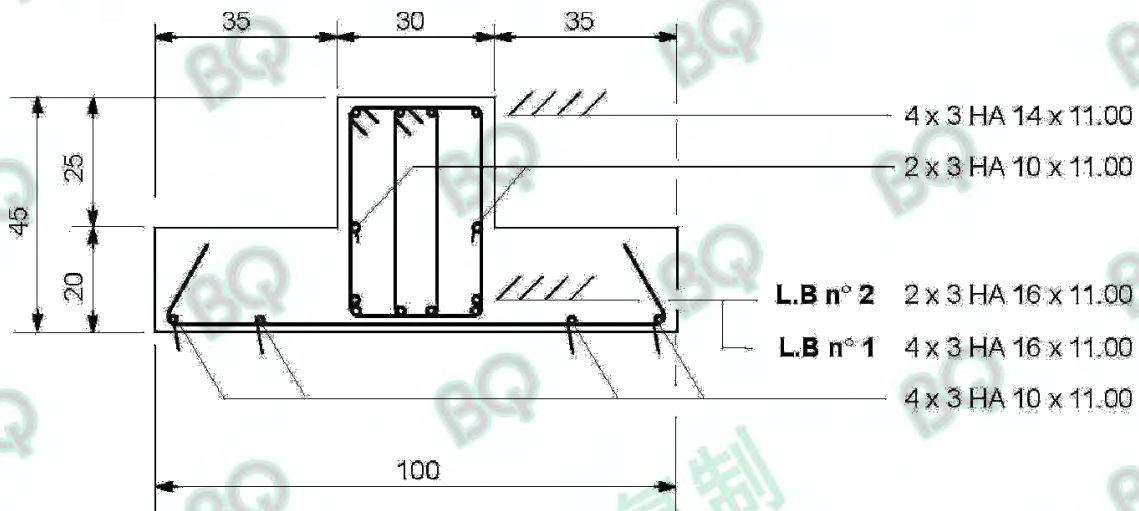
L.R. = 55t ⇒ 75t: sleeper used in vertical direction and with maximum reaction

between 55T and 75T

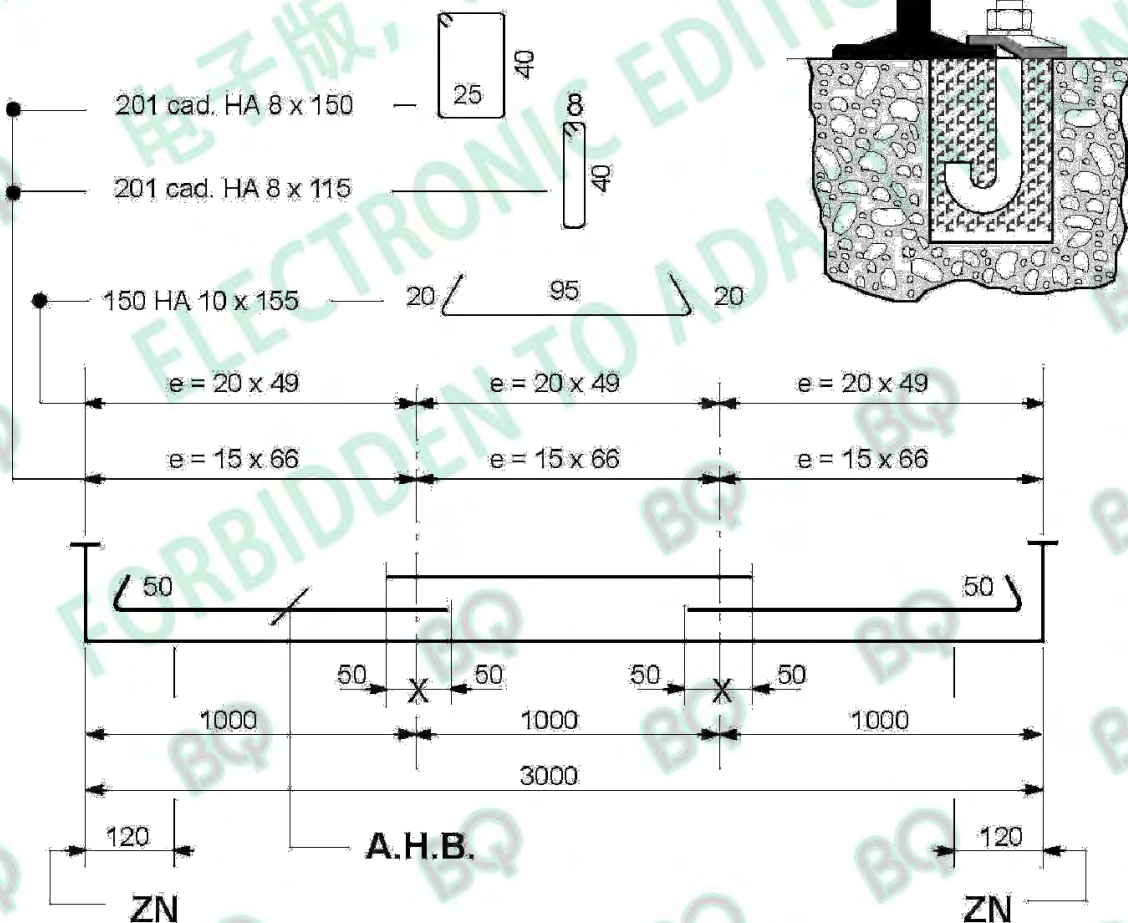
P.R.: bar weight per meter (kg)

T.R.: steel track type

Sleeper used in vertical direction and with maximum reaction of 45T



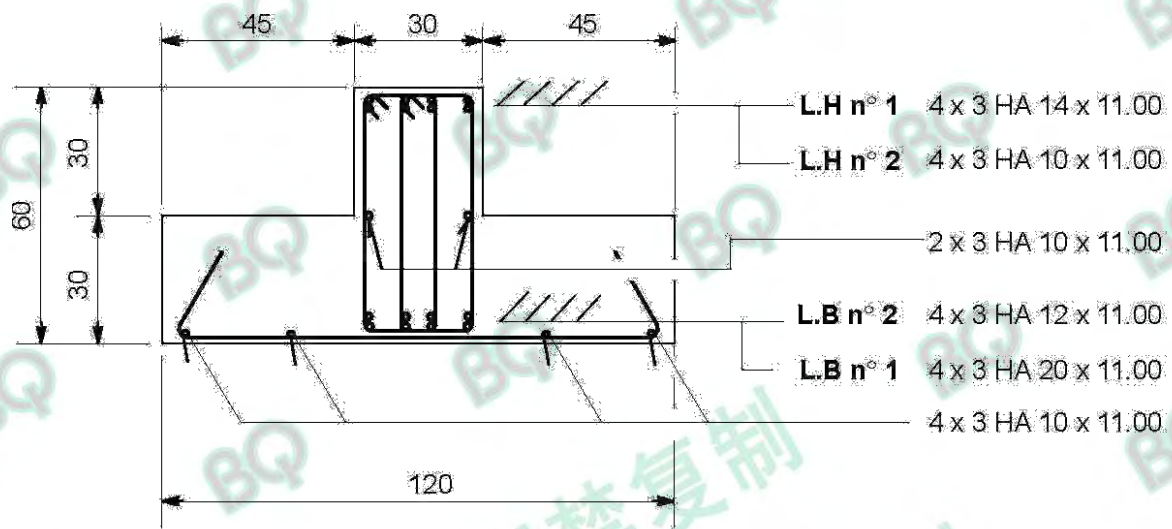
T. R. : VIGNOLE



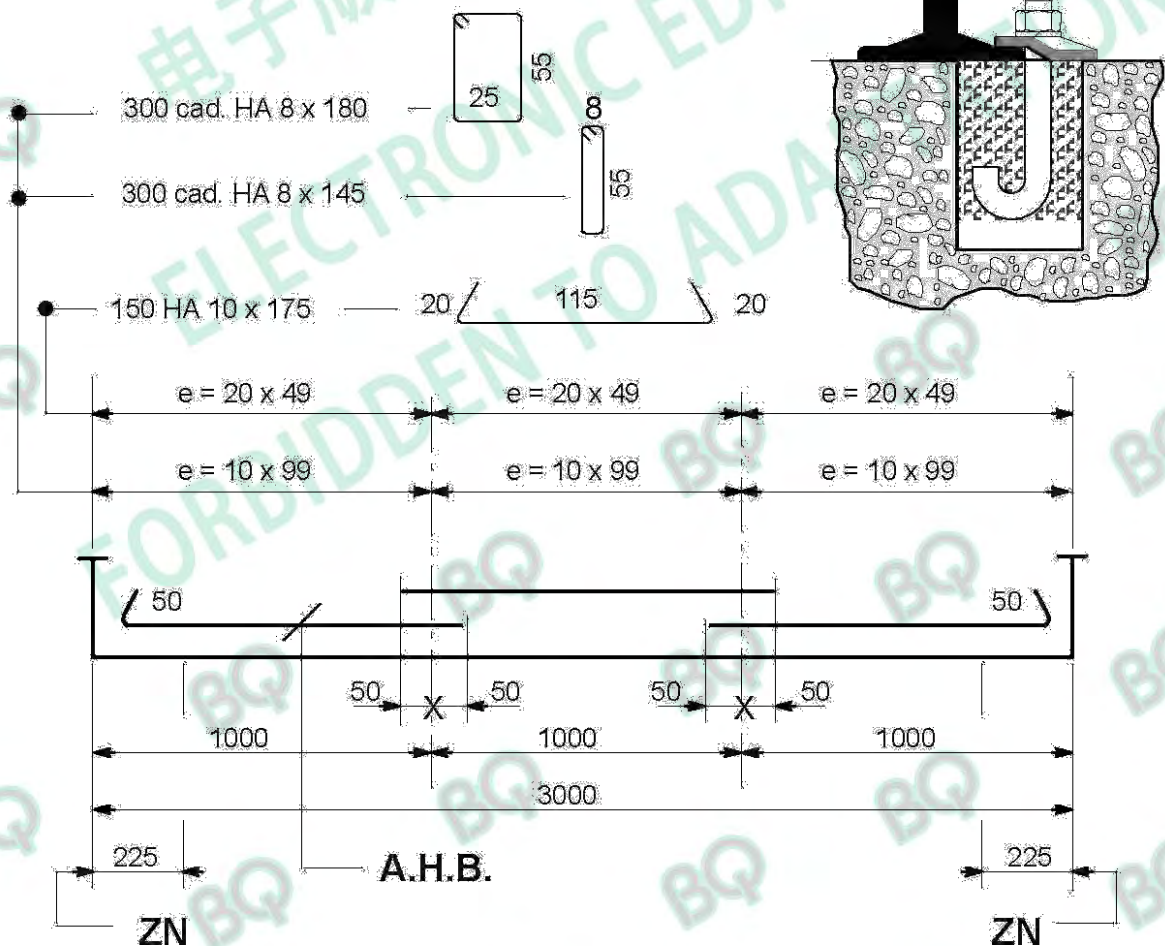
L. R. = 45 t

P. R. = 45 daN

Sleeper used in vertical direction and with maximum reaction between 55T and 65T

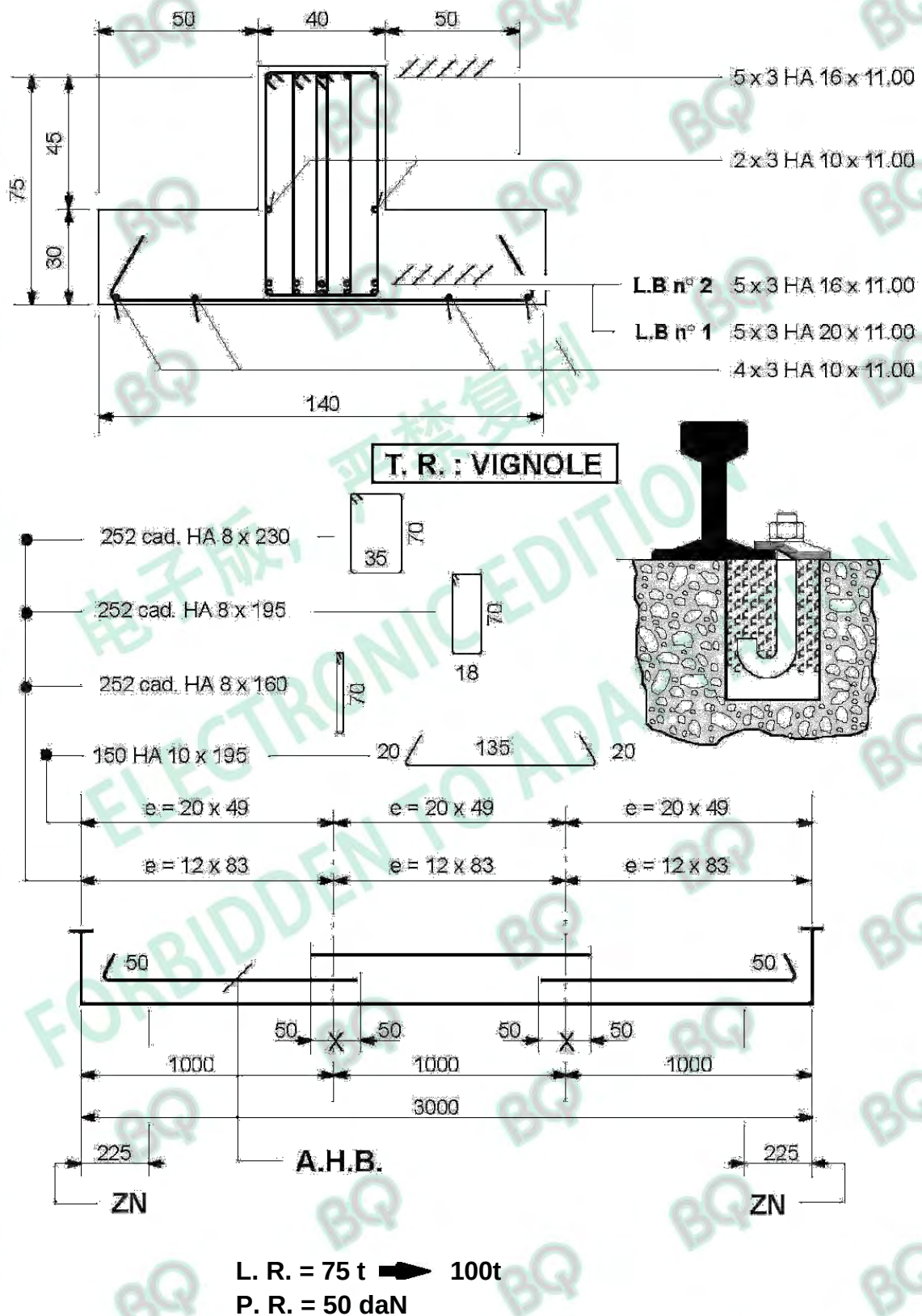


T. R. : VIGNOLE

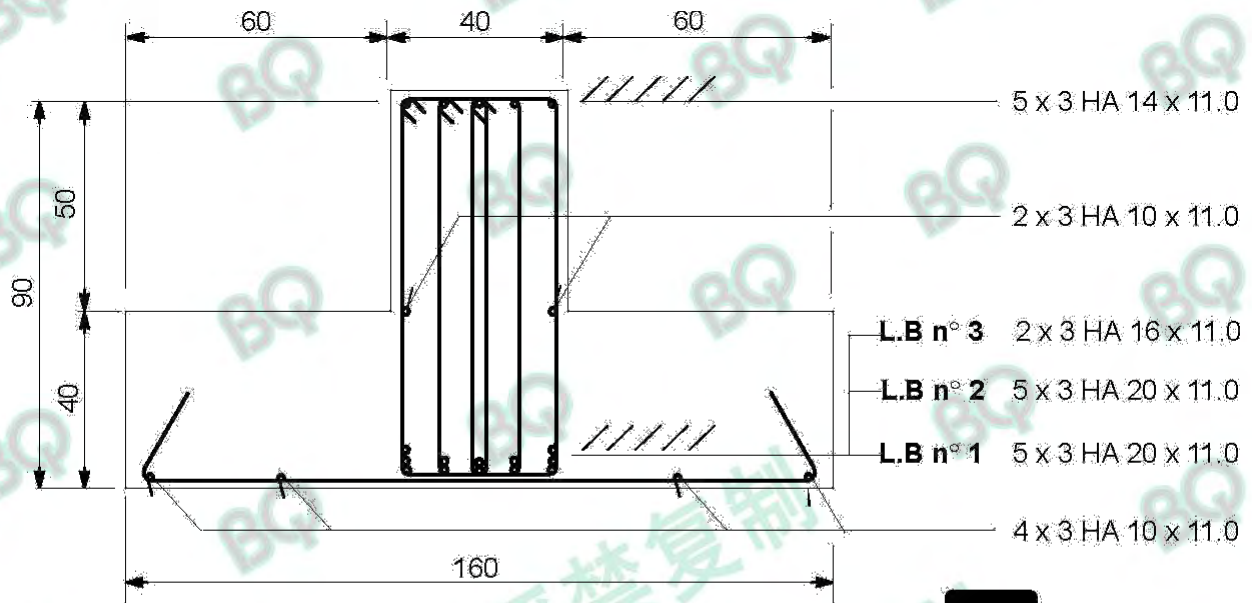


L. R. = 55 t ➡ 65t
P. R. = 45 daN

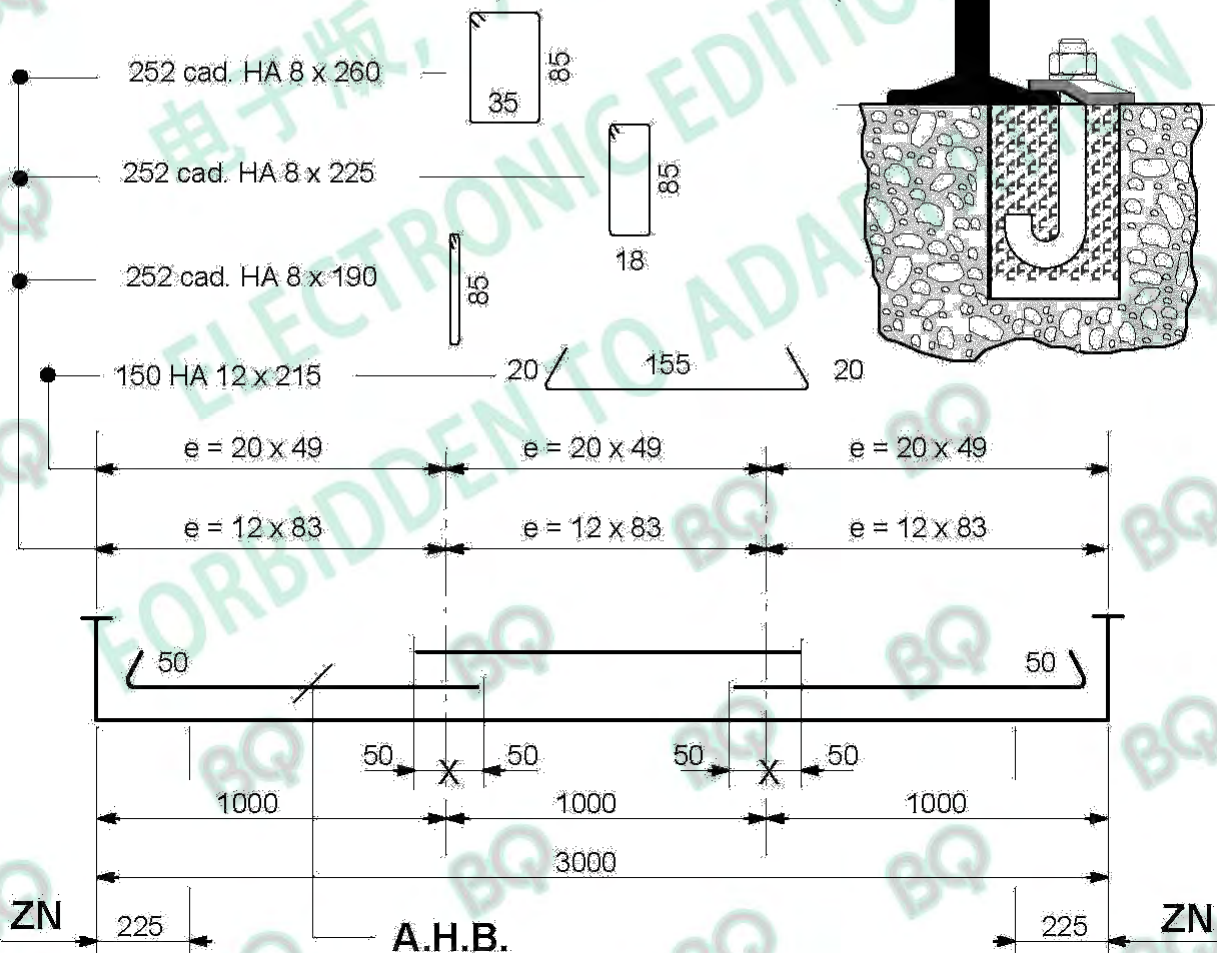
Sleeper used in vertical direction and with maximum reaction between 75T and 100T



Sleeper used in vertical direction and with maximum reaction between 115T and 130T

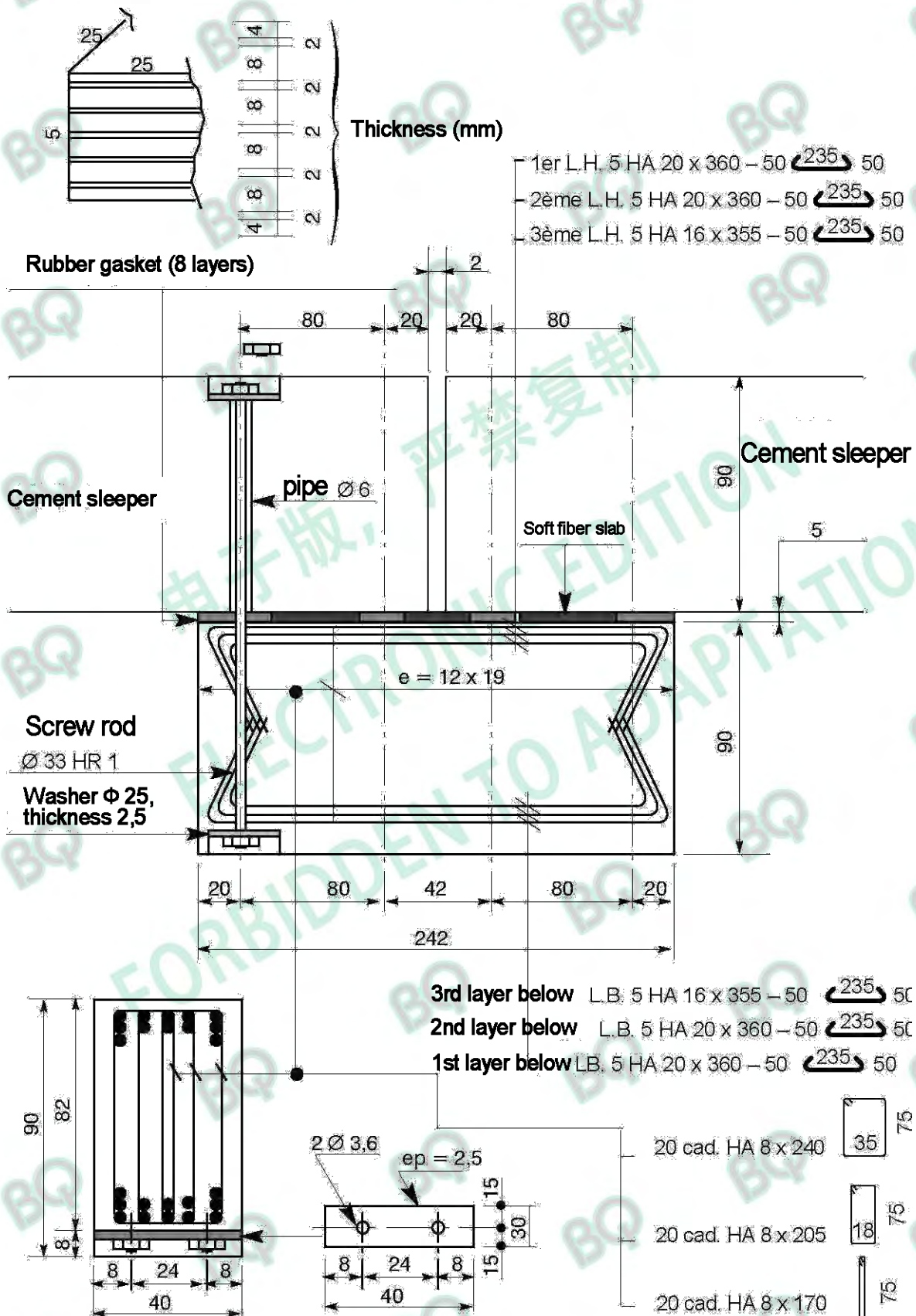


T. R. : VIGNOLE

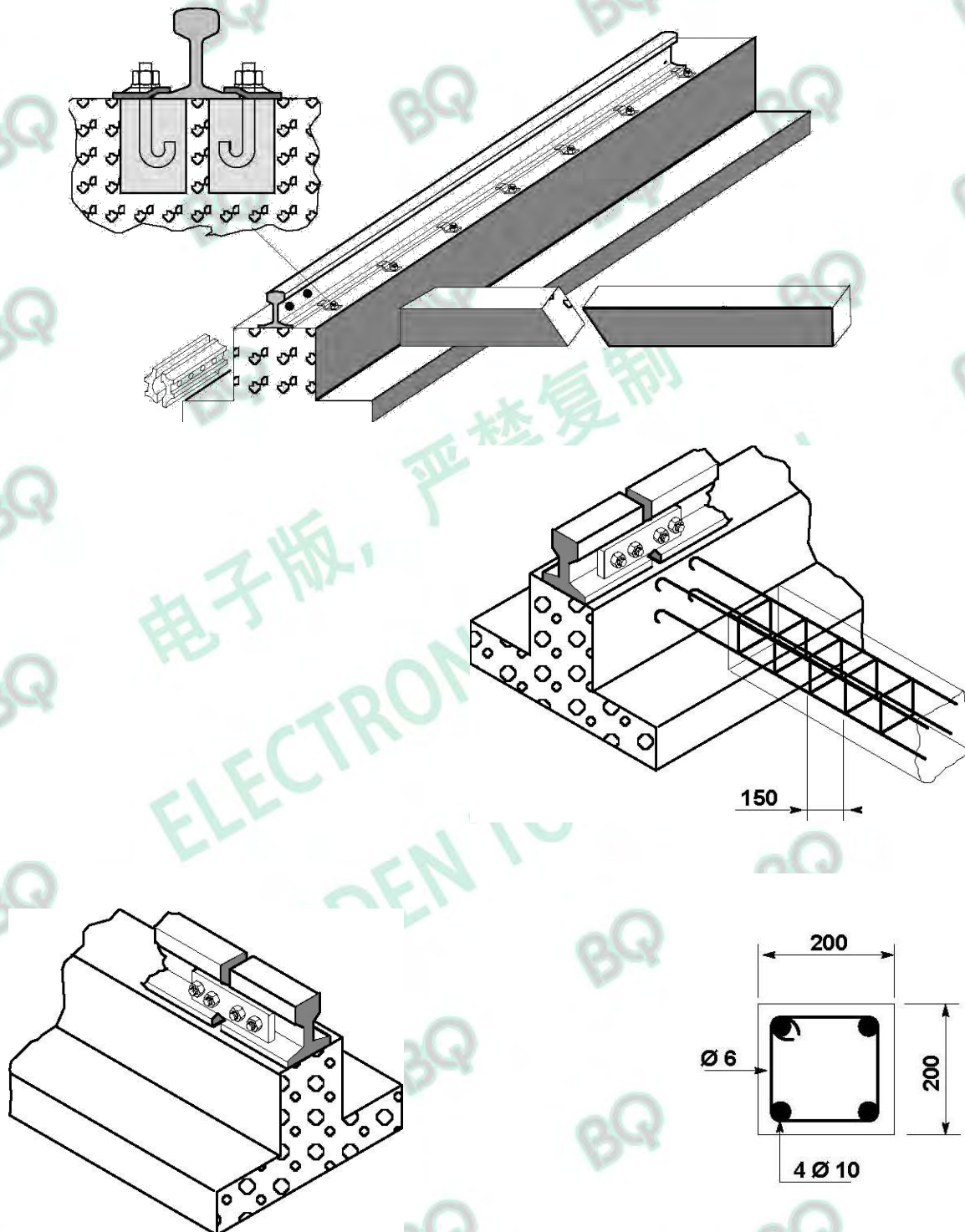


L. R. = 115 t ➡ 130t
P. R. = 54daN

Installation of cement sleepers



Connection of cement sleepers



Special note: connection clearance between cement sleepers shall equal to center distance between tracks.

7) Installation of stationary chassis

Chassis on cement support legs

In such type, four support legs shall be in the same horizontal plane in order to ensure perpendicularity of the crane.

Chassis on cement board

In such type, four support legs must be in the same horizontal plane in order to ensure perpendicularity of the crane.

Flatness tolerance

For installation of chassis on cement support legs or cement board, the flatness is $1/400$ of L . (Fig. 1)

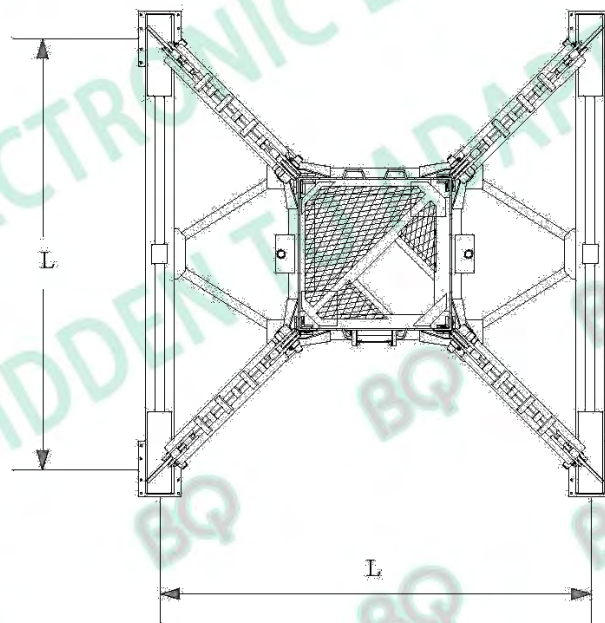
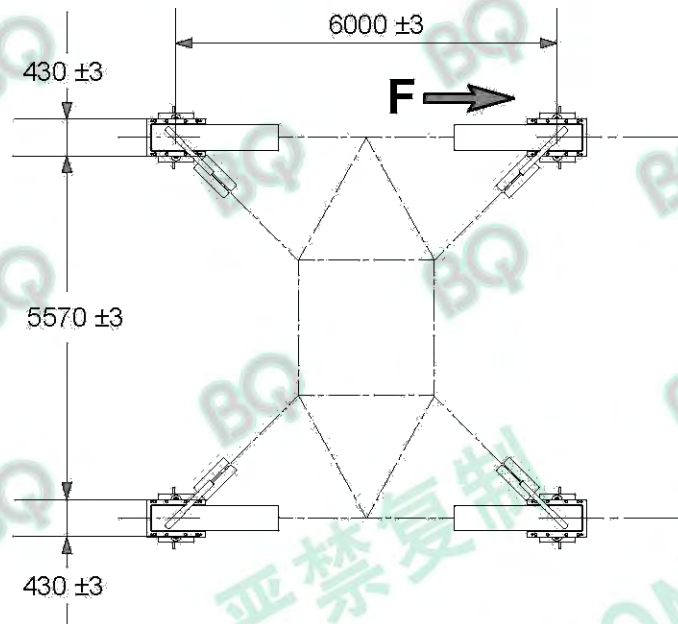


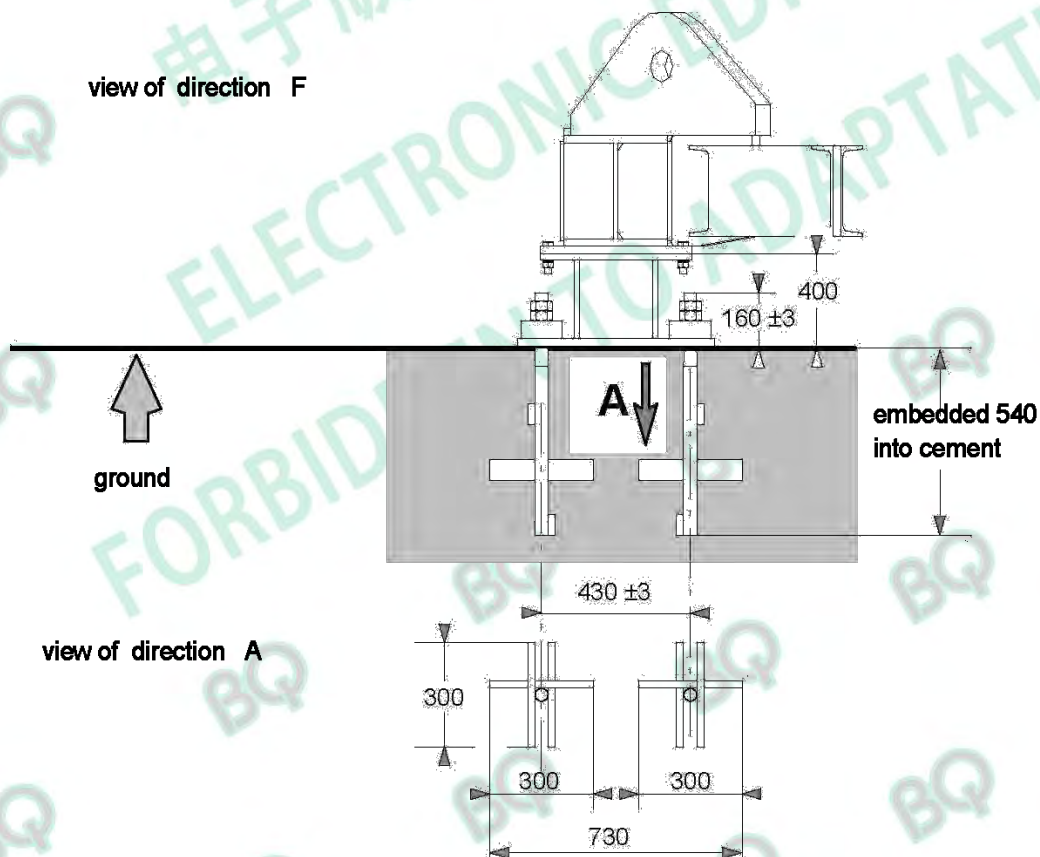
Fig. 1

① Installation of stationary chassis (cement support legs)



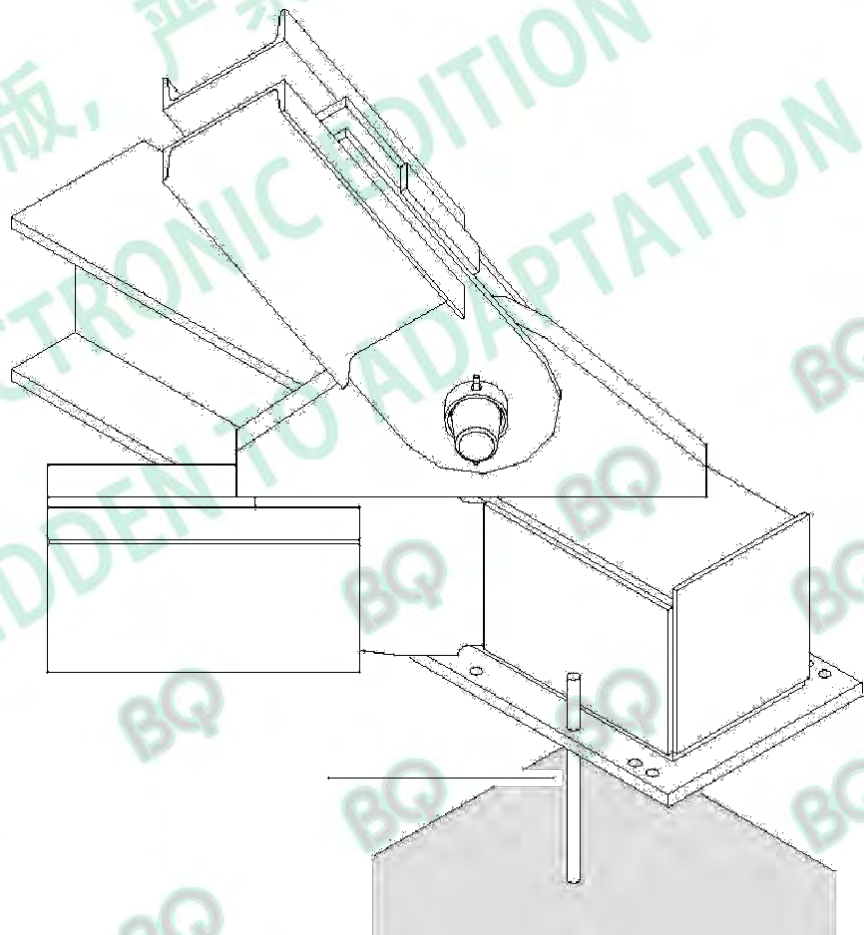
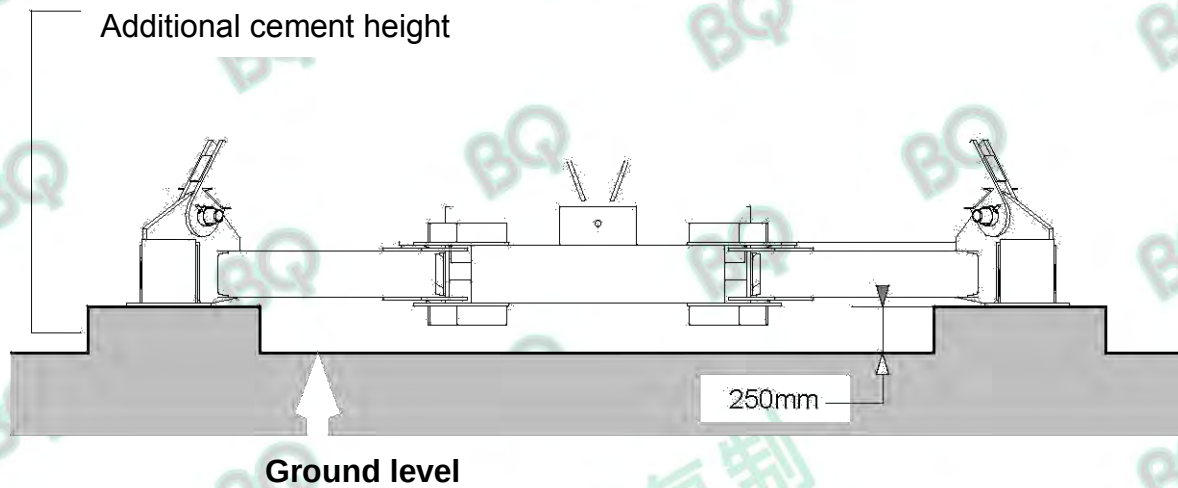
Tolerance, inclination and accumulative inclination, 1/400 of the track.

view of direction F



view of direction A

② Installation of stationary chassis (cement board)

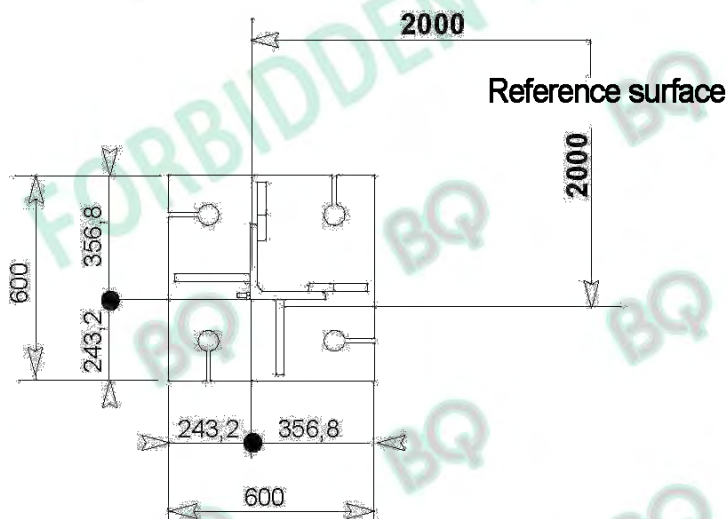
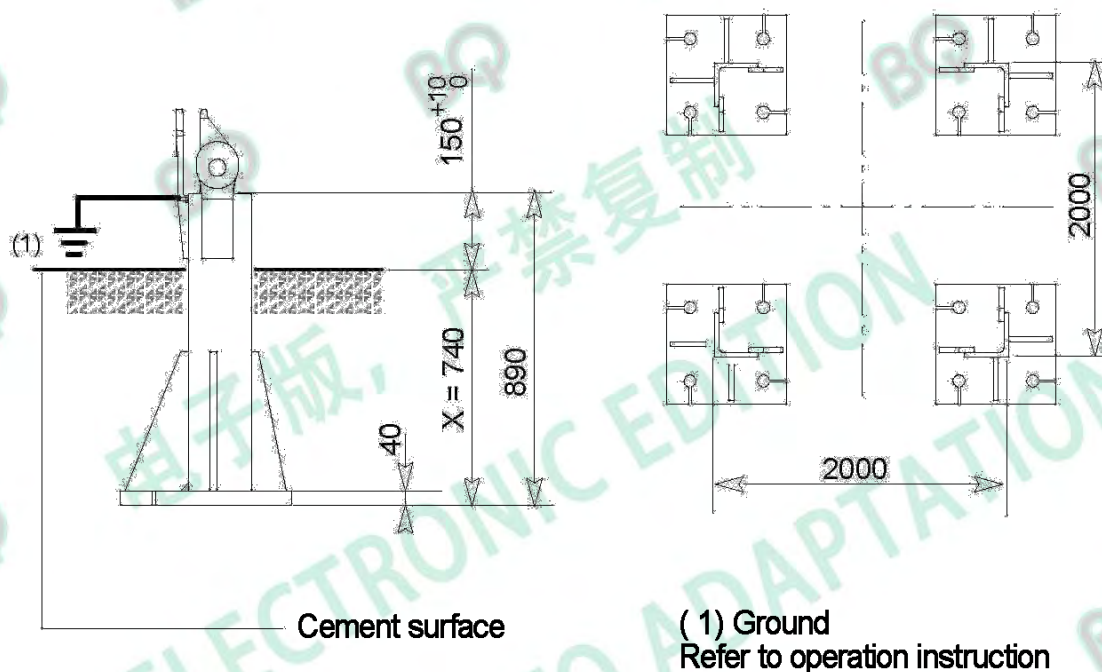


Lateral lacking devices shall be added and the quantity shall be determined by the crane users.

IV Fixing Support Legs and Foundations

1 Installation of Unrecoverable Support Legs

1) Dimension characteristics of fixing support legs



2) Fixing of support legs

The following components shall be provided to fix support legs securely:

- 4 fixing support legs and 8 pin rolls
- 1 fixing frame
- 1 mast section
- Measuring instrument

The support legs and frame can be prepared before supply of the crane.

The support legs shall be installed symmetrical to center line of the cement foundation and form a square shape according to the dimension of the mast connected with it.

Flatness error: $1/400$ cross section of the mast section.

Near the support legs, do not cut the bars or reduce the bar quantity.

Pay attention to correct grounding of the support legs, and the frame is only used for installation of the support legs.

Note: when connecting the support legs and the frame, pay attention to cleaning of the pin rolls which shall be free of any fouling.

-When placing support leg (1) outside and inside of the pit, guarantee its size of space (library-Detail Drawing A).

- Place frame (2) onto four support legs, and then put it down at the fish plate (a) (Fig. 1-Detail Drawing A). Fix the frame with four pins (3) and insert the cotter pin (Detail Drawing C).

- Place mast section (4) into fish plate of the leg frame (Fig. 1-Detail Drawing D). Fix the frame with four pins (5) and insert the cotter pin (Fig. 1-Detail Drawing D).

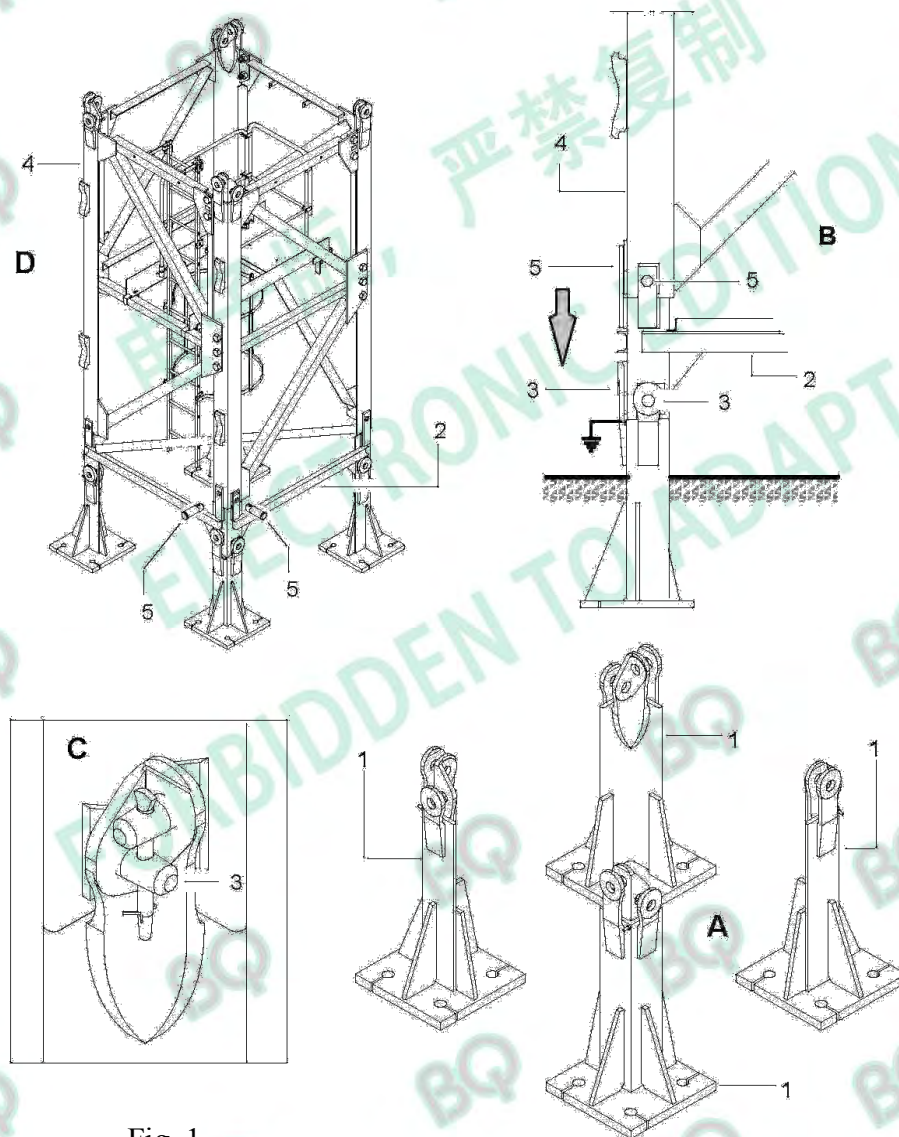
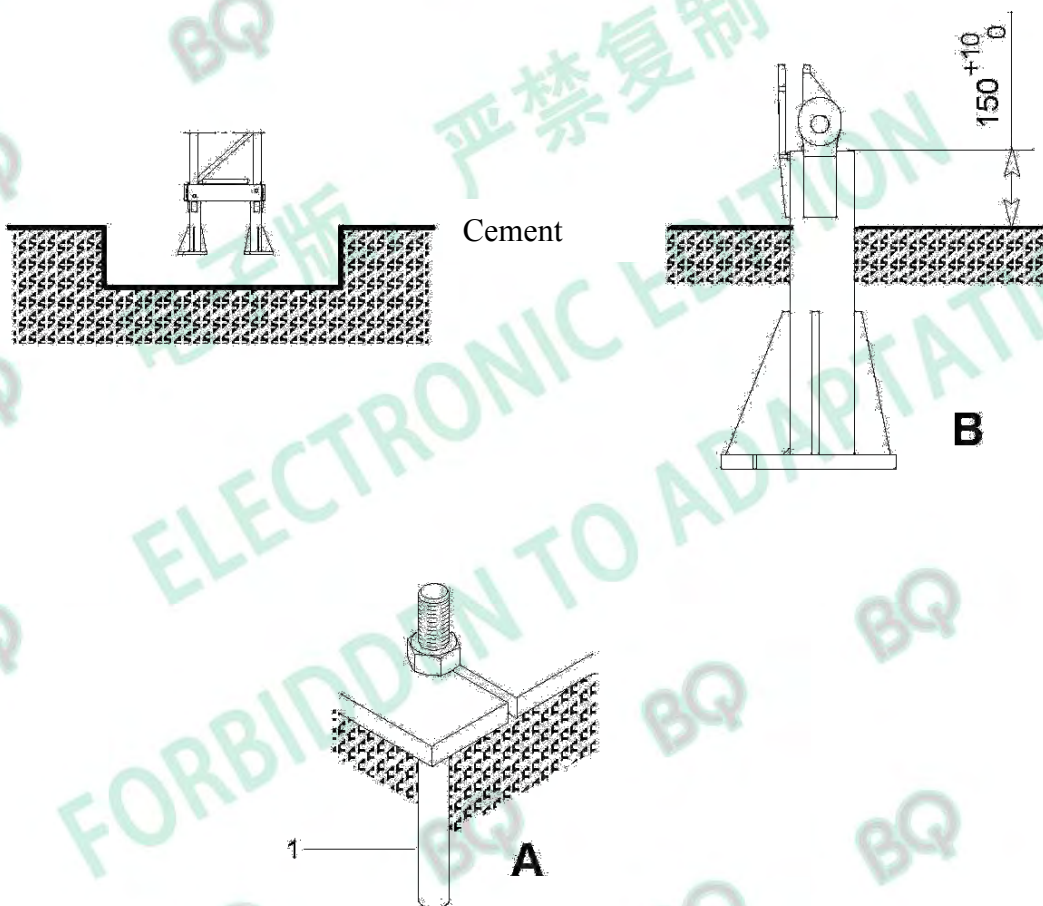


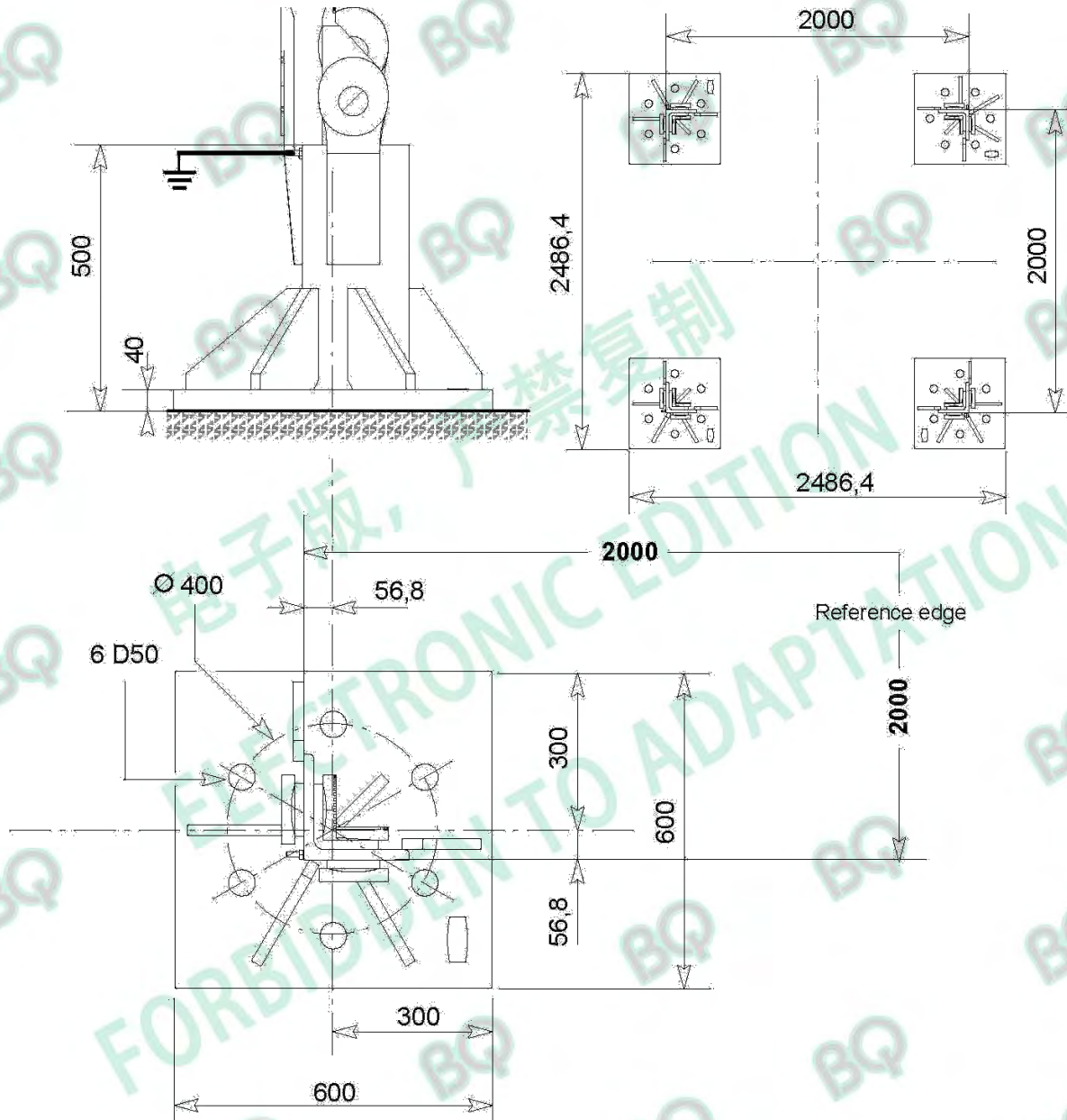
Fig. 1

- Place the support legs, frame and mast section assembled into reinforced bar in the pit and arrange an adjustable cushion block (1) under the support legs (Detail Drawing A).
- Size of 150mm shall be ensured strictly (Detail Drawing B).
- Check the perpendicularity with a measuring instrument.
- Pour concrete and remove the frame and mast section after the concrete becomes dry and hard.



2 Installation of Recoverable Support Legs

1) Dimension characteristics of fixing support legs



Dimension in mm

2) Installation of support legs

Users are responsible for dimension, quantity and installation method of fixed screw rod of the support legs in cement foundation (or other structures).

Regarding cement foundation, dimension and ground pressure, standard cement foundation provided by the manufacturer of cement foundation can be used. The standard cement foundation is determined by base plate type of the fixing support legs; therefore, cement foundation applicable to recoverable fixing support legs and their connecting method must be used. And connecting method of the recoverable fixing support legs and cement foundation is determined by users. (Reinforced cement shall be suitable to the screw rod used).

Do not cut off or reduce the reinforced bar quantity in cement perpendicular to support legs.

Fixing support legs can be supplied to the customer before delivery of the whole crane unit so as to determine installation position of the legs' fixing rod, and fixing frames can also be provided before delivery of the crane.

Fixing frames are only used to place fixing support legs in place.

During installation of this unit, height below the crane hook is 290mm larger than standard fixing support legs.

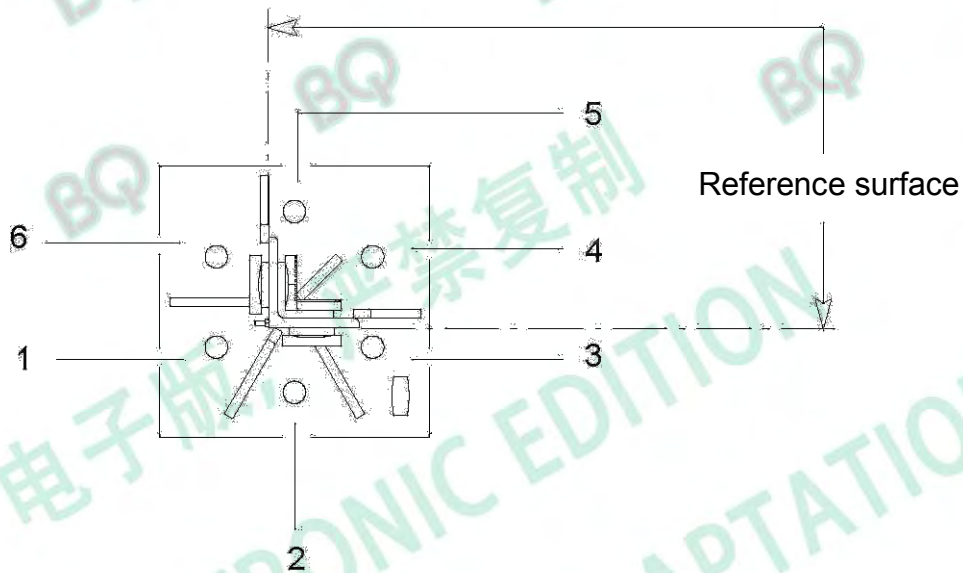
Note: Customers shall be responsible for selection, installation and fixing of the screw rod.

② Installation of screw rod

Installation of screw rods may vary with their quantity.

1, 3, 4 and 6 are used for four screw rods.

1, 2, 3, 4, 5 and 6 are used for six screw rods.



③ Installation of support legs

Place support leg (1) at the interval specified. (Detail A)

Place frame (2) onto four support legs to make it close to the fish plate (Detail Drawing C).

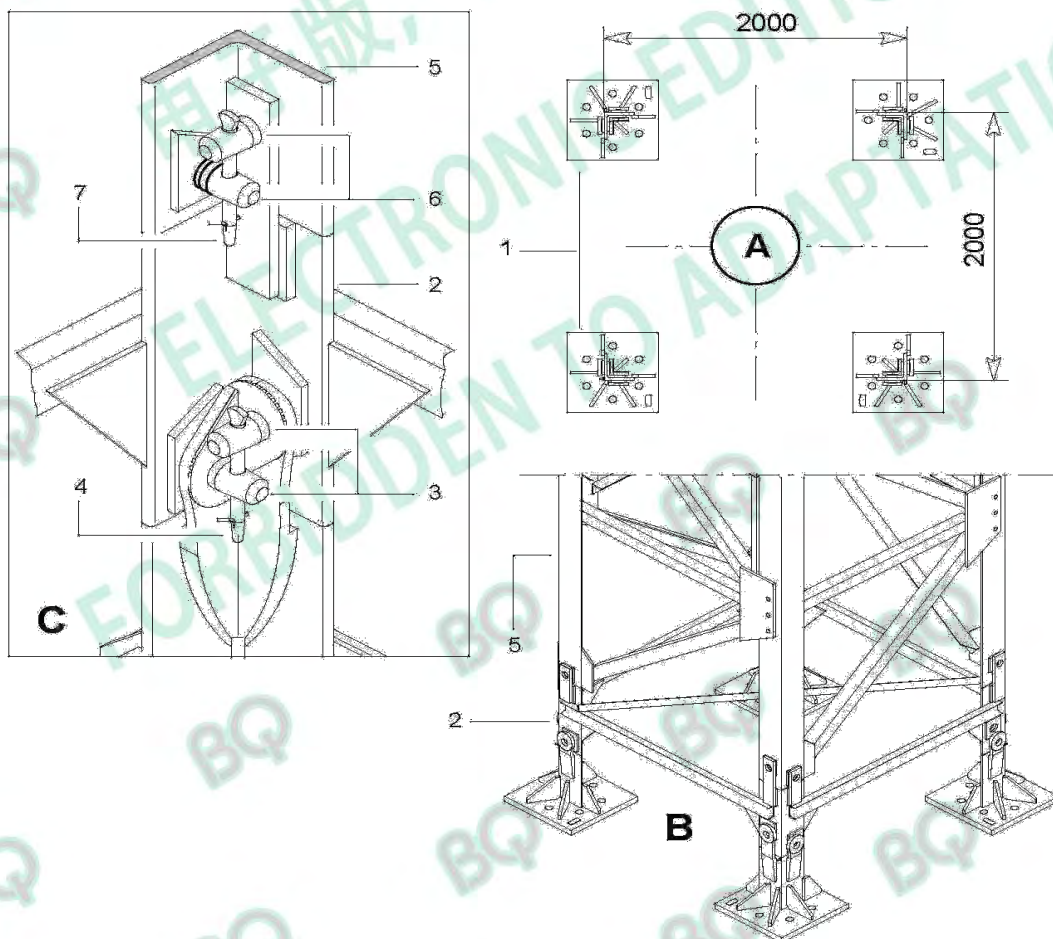
Fix the frame with 4×2 pin rolls and insert a cotter pin (Detail Drawing C)

Screw up the return nut as required by the supplier.

Place mast section (3) onto fish plate of the fixing support legs (Detail Drawing B). Lift up frame (2) to insert pin roll (4).

Horizontal tolerance: 1/400 cross section of the mast section.

Note: when assembling the fixing support legs and the frame, make sure that the connecting holes and connecting pins are clean and free of any oil dirt.



3 Manufacturing of Cement Foundation

Description and illustration

Name of cement foundation (M54N)

M: cement foundation

54: weight of cement foundation (T) N: code

Steel bars of a cement foundation is composed of upper and lower parts which are connected by iron hooks, and each of the parts consists of two steel bar layers which cross each other.

(Example)

Upper layer

6 HA 16 × 450 e : 15

6: bar quantity

HA : high-adhesion round steel

16 : round steel diameter (mm)

450 : round steel length

e : clearance (mm)

Lower layer

ep: iron hook

D: density

V: volume (m³)

L: length (cm)

I: width (cm) (cm)

H: height (cm)

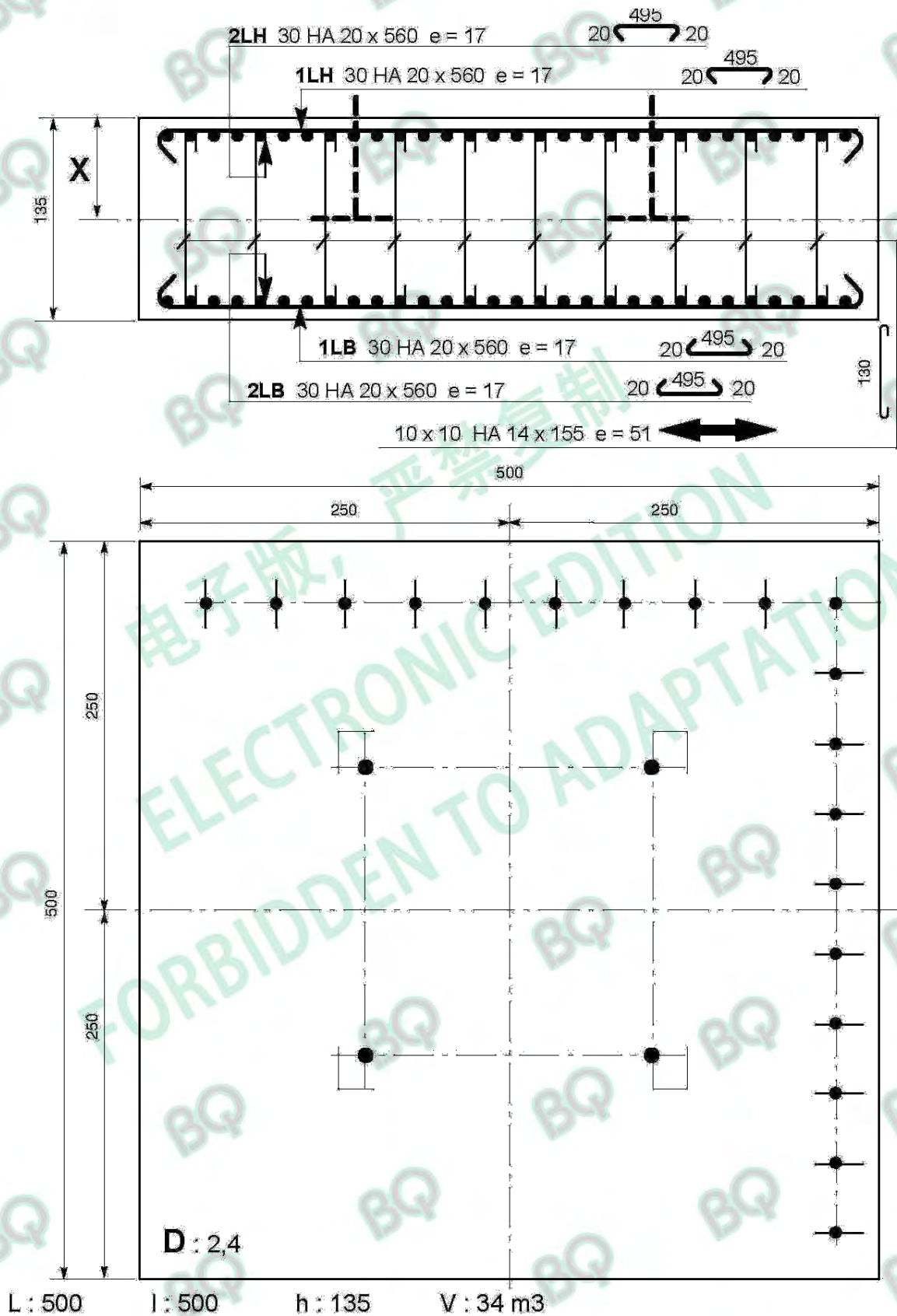
1LH : 1st layer above

1LB : 1st layer below

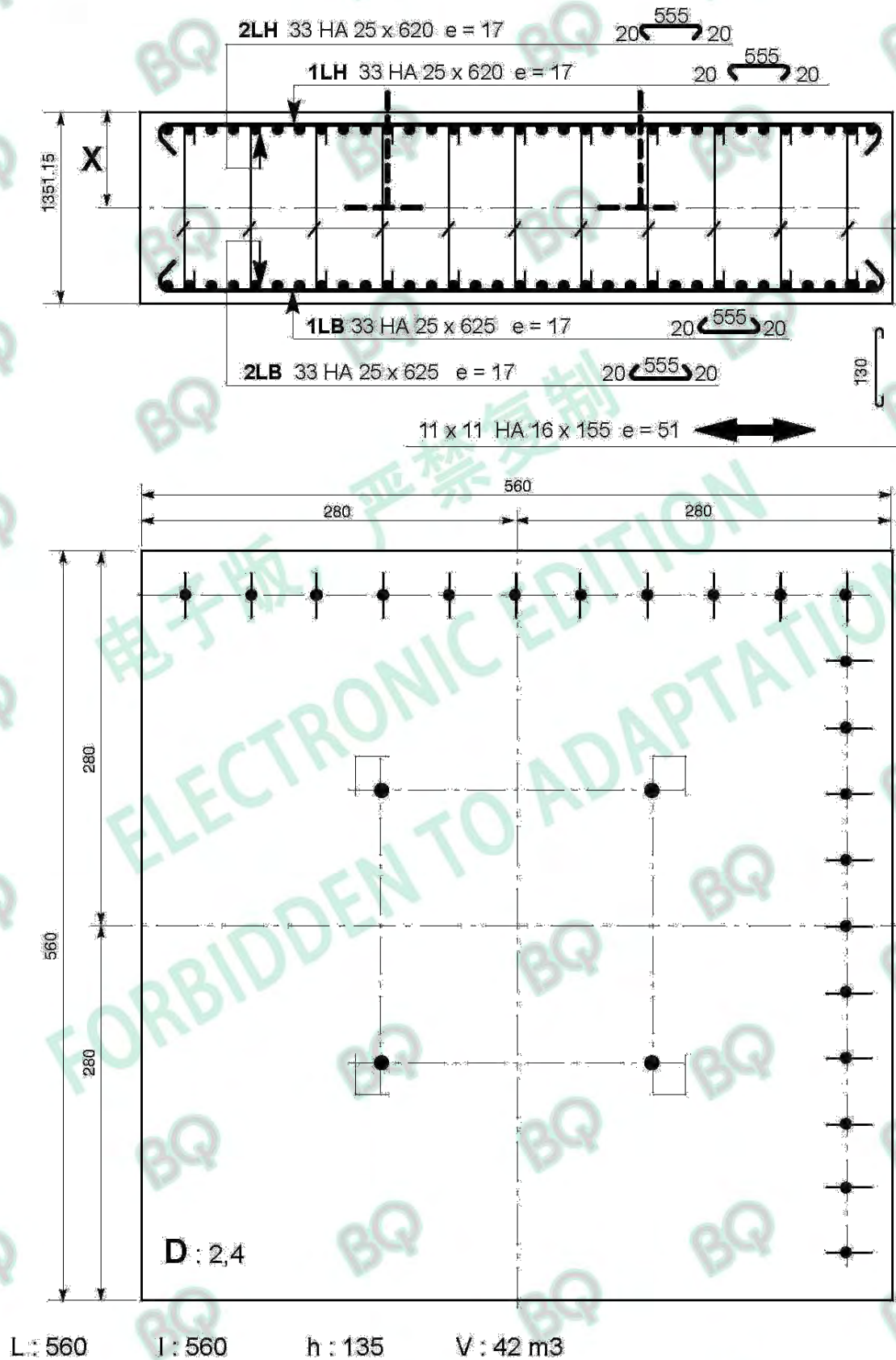
2LH : 2nd layer above

2LB : 2nd layer below  In two directions

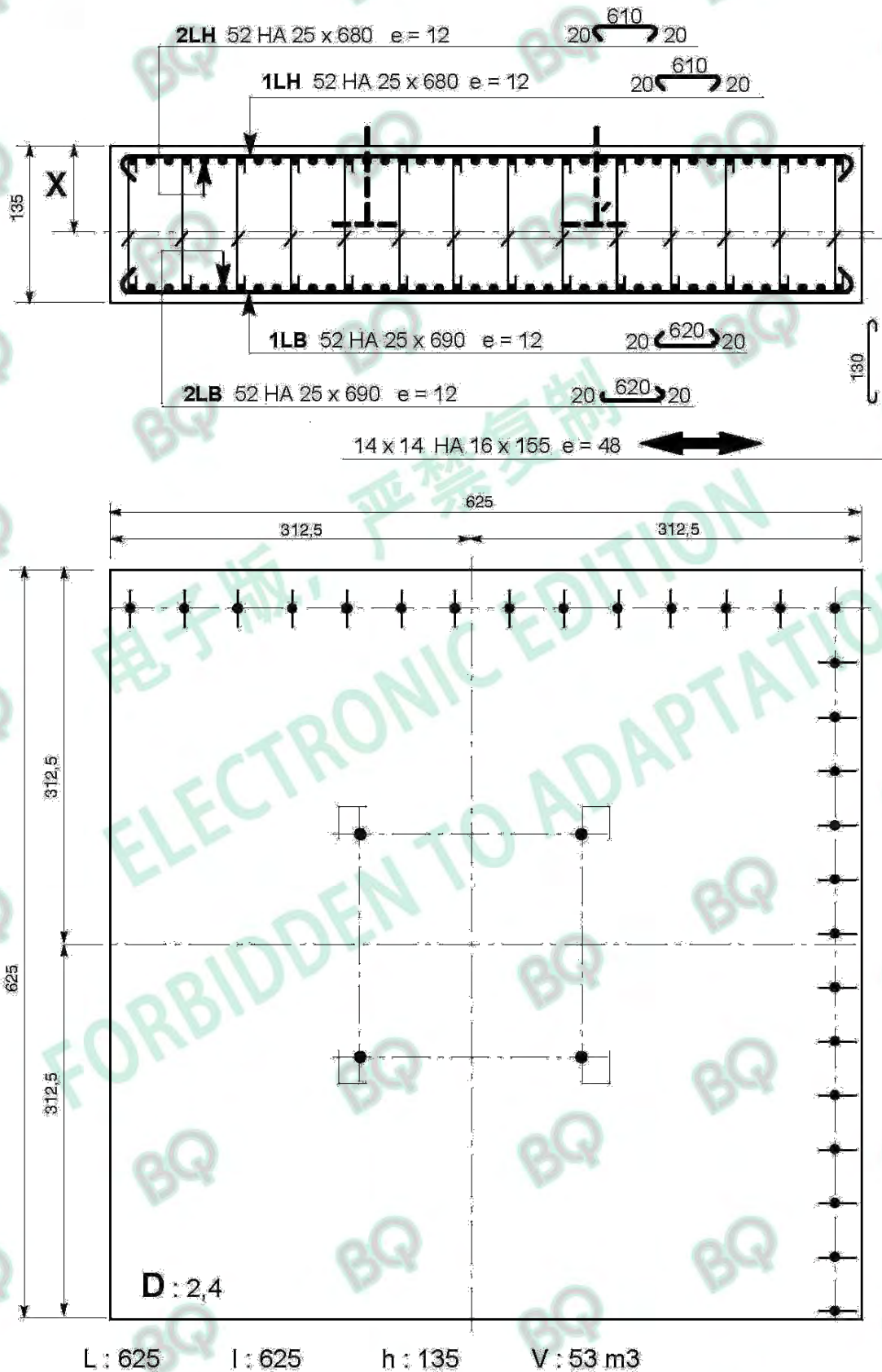
Cement foundation (M81N)



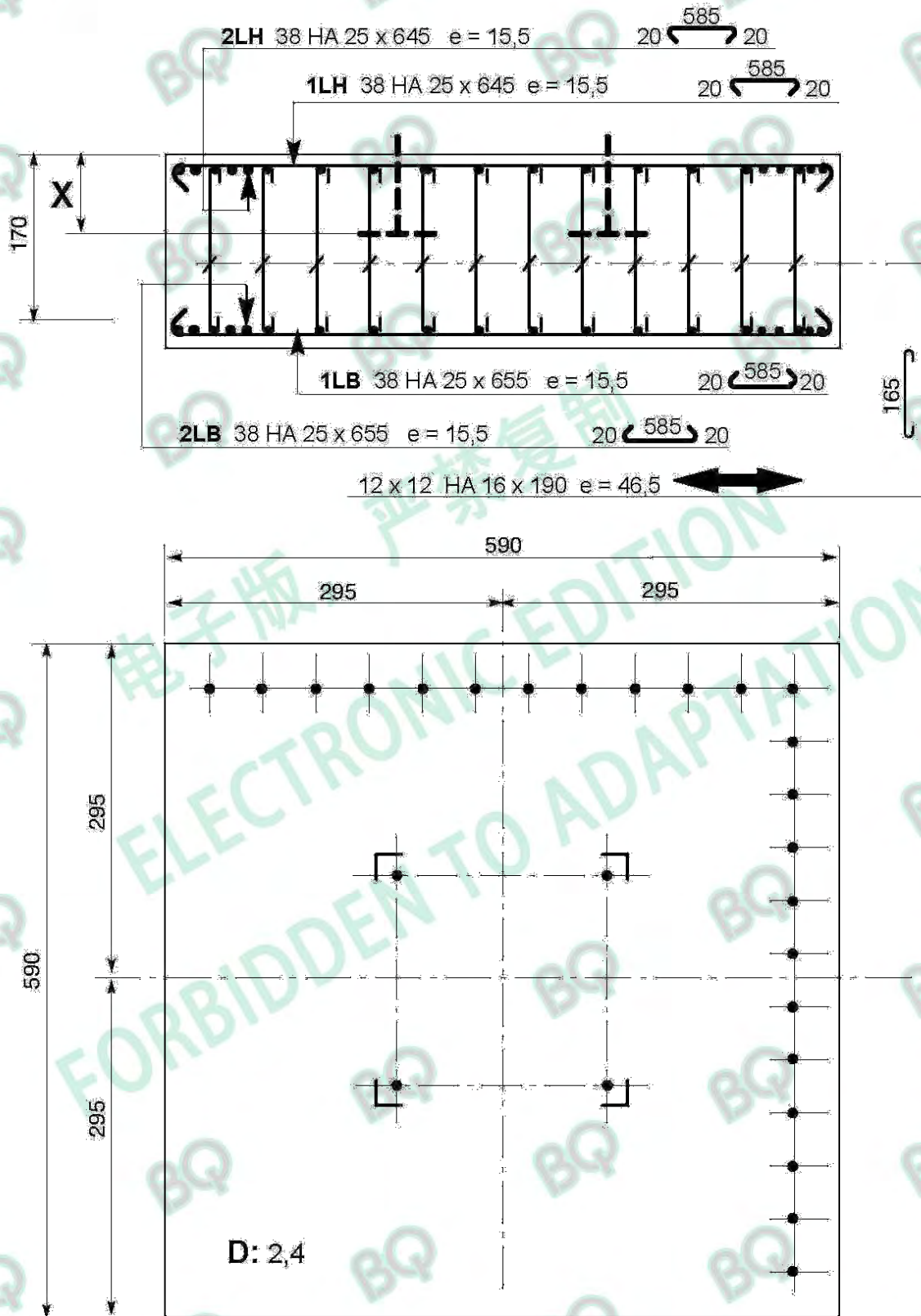
Cement foundation (M101N)



Cement foundation (M126N)

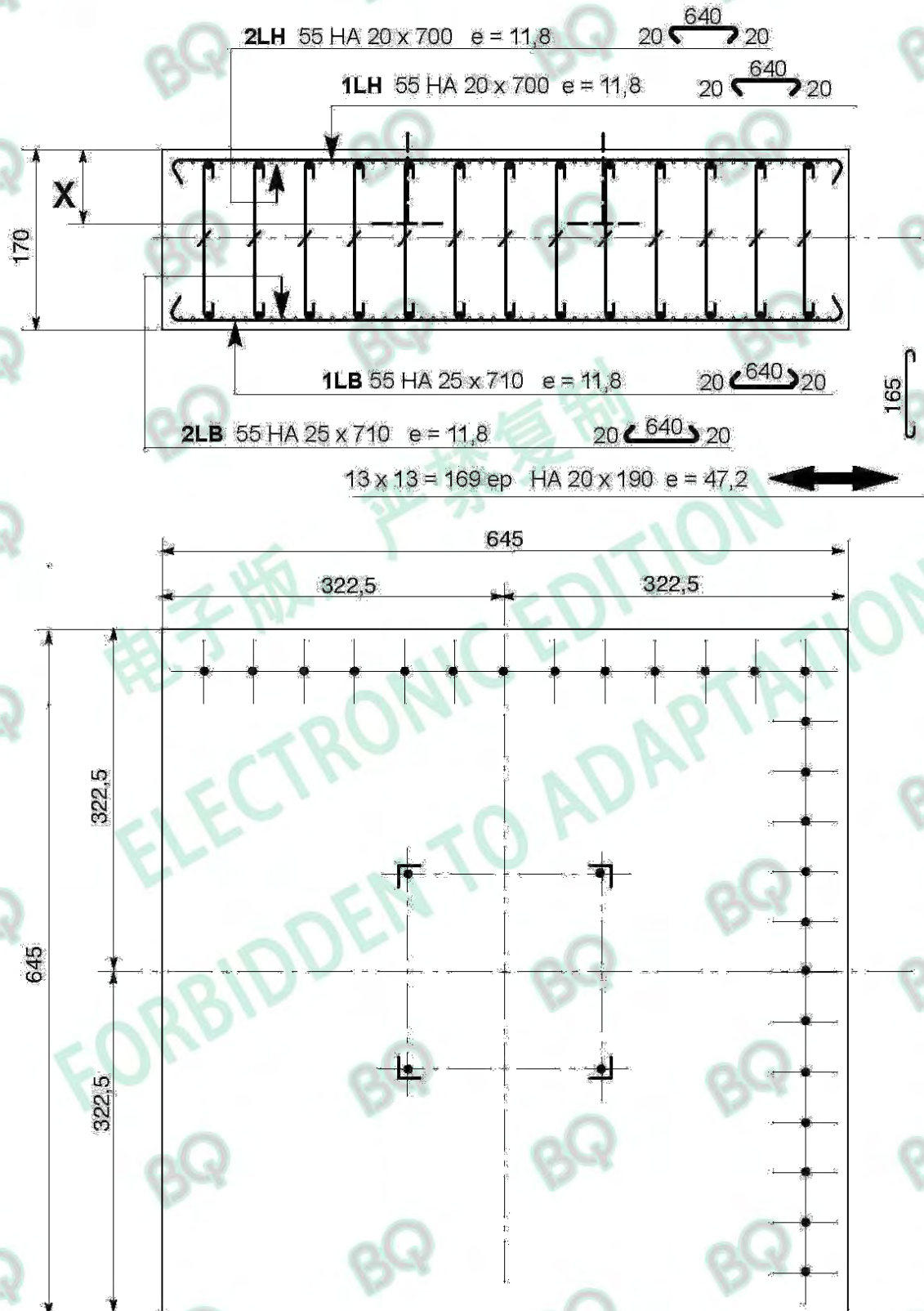


Cement foundation (M142N)



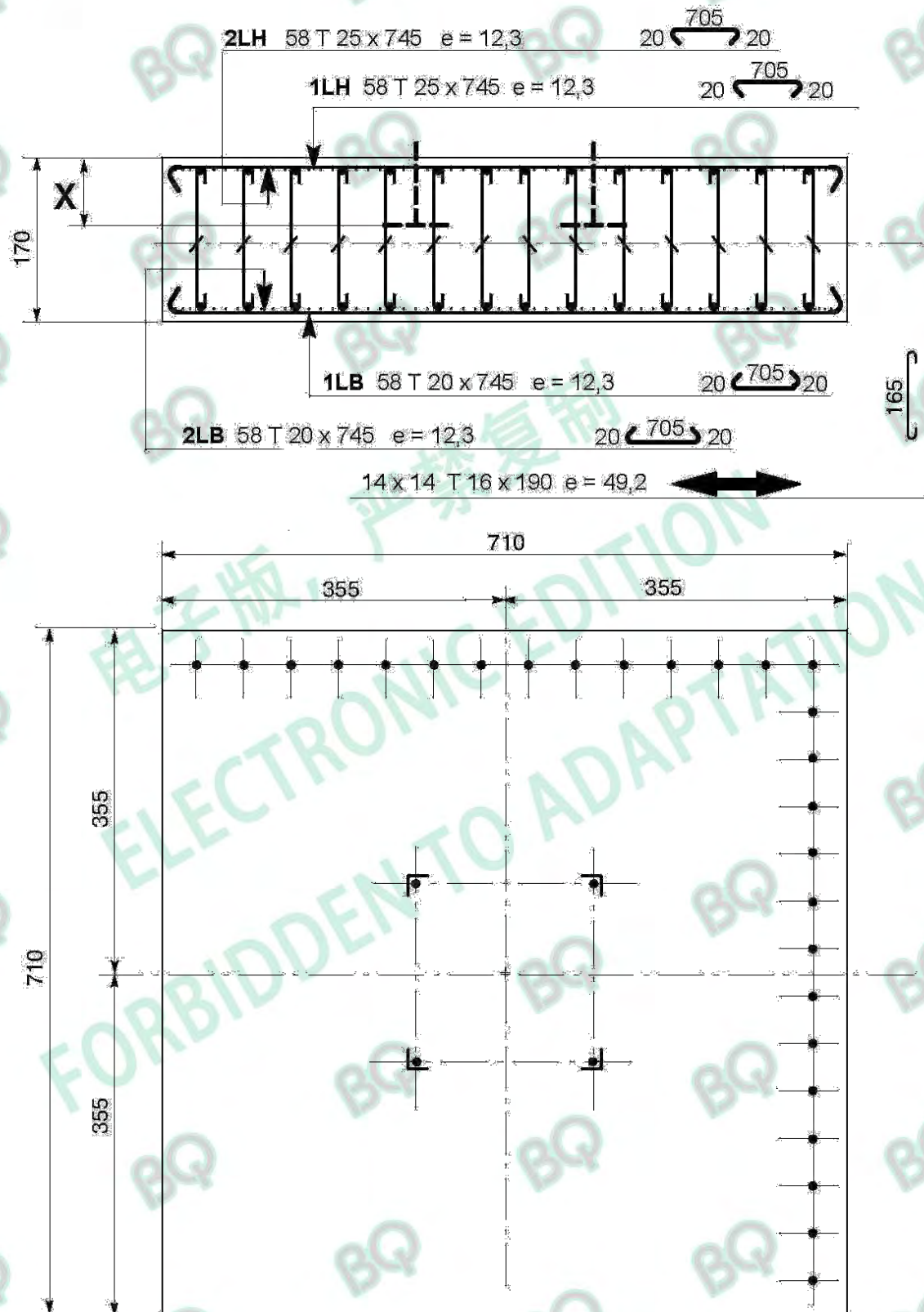
L : 590 l : 590 h : 170 V : 59 m³

Cement foundation (M169N)



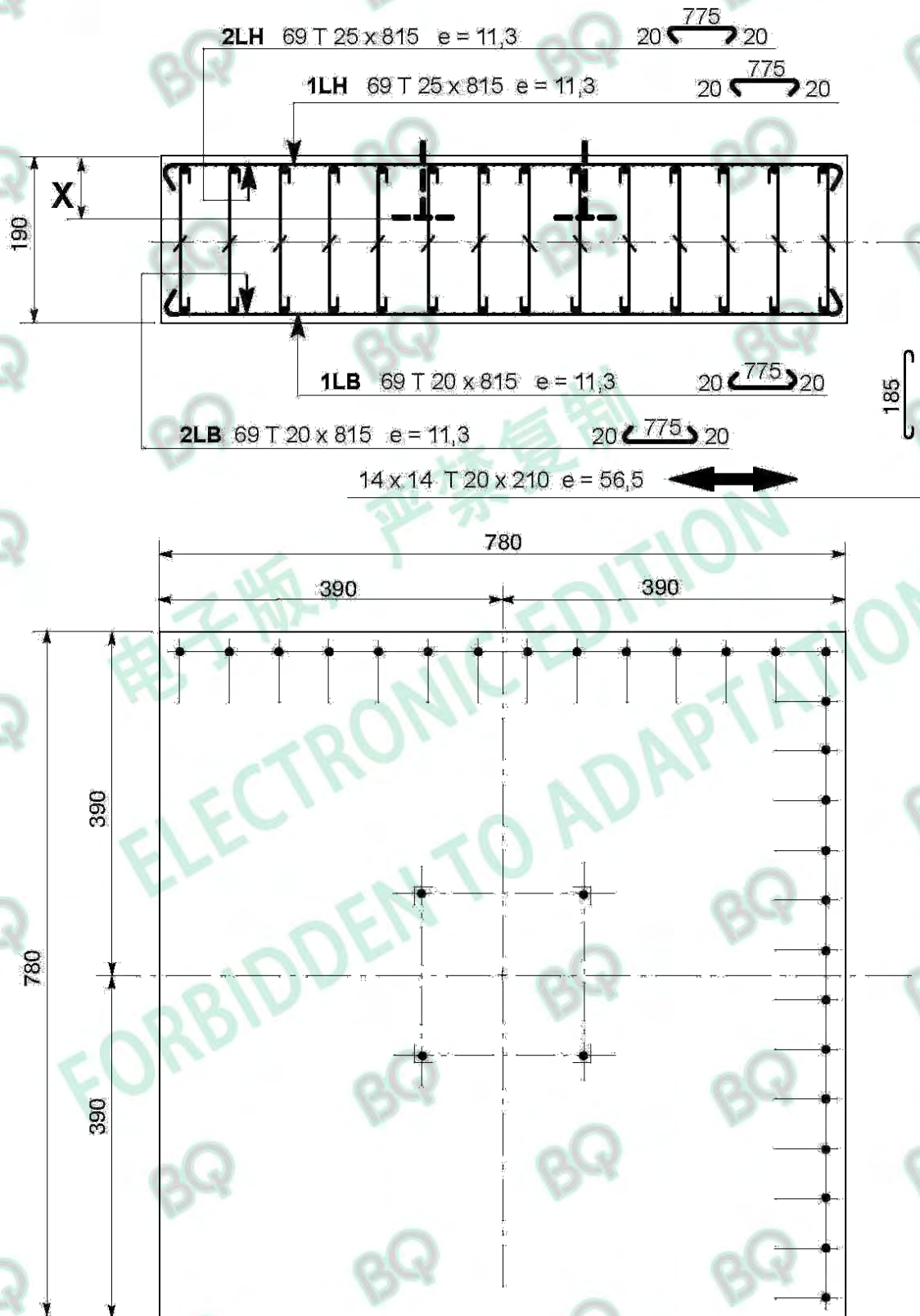
D: 2,4 L: 645 l: 645 h: 170 V: 71 m³

Cement foundation (M205N)



D: 2,4 L: 710 l: 710 h: 170 V: 85m3

Cement foundation (M278N)



L: 780 l: 780 h: 190 W: 116 m³

D: 2,4

4 Force —Pressure

C—assembly of the crane's mast section

H—hook height (m), see relevant data P—weight M—maximum torque

ET—shear force R—support reaction TRACT—tension COMP—pressure

ES—in service HS—out of service

C	H (m)	ES					HS				
		P (kg)	M (kgm)	ET (kg)	R(t)		P (kg)	M (kgm)	ET (kg)	R(t)	
					TRA CT	COM P				TRA CT	CO MP
2+0+1	16.5	97520	36643	2822	51	92	81520	82562	7245	41	82
2+1+1	19.5	99055	43332	2967	52	95	83055	12196 0	8749	41	82
2+2+1	22.5	10059 0	50455	3112	55	97	84590	14389 4	9280	41	83
2+3+1	25.5	10212 5	58014	3257	57	100	86125	16978 5	9917	40	83
2+4+1	28.5	10366 0	66007	3402	51	103	87660	19759 0	10555	40	84
2+5+1	31.5	10519 5	74435	3547	54	107	89195	22730 7	11192	39	84
2+6+1	34.5	10673 0	83298	3691	58	111	90730	25893 7	11830	39	84
2+7+1	37.5	10826 5	92595	3836	63	117	92265	29247 9	12468	39	85
2+8+1	40.5	10980 0	10232 7	3981	67	122	93800	32793 4	13105	38	85
2+9+1	43.5	11133 5	11249 4	4126	73	128	95335	36530 2	13743	51	99
2+10+ 1	46.5	11287 0	12309 5	4271	78	135	96870	40458 2	14380	66	114
2+11+ 1	49.5	11440 5	13413 1	4416	84	141	98405	44577 6	15018	81	130
2+12+ 1	52.5	11594 0	14560 2	4561	90	148	99940	48888 2	15655	97	147

5 Selection of Cement Foundation

Hook Height	Cement Foundation (T)						
	81T	101T	126T	142T	169T	205T	278T
	Pressure below Cement Foundation (daN/cm ²)						
16.5	2.2	1.6	1.2	1.5	1.2	1.0	0.9
19.5	2.3	1.6	1.3	1.5	1.3	1.1	1.0
22.5	2.4	1.7	1.3	1.5	1.3	1.1	1.0
25.5	2.5	1.7	1.3	1.6	1.3	1.1	1.0
28.5	2.6	1.8	1.3	1.6	1.3	1.1	1.0
31.5	2.7	1.8	1.4	1.7	1.4	1.1	1.0
34.5	2.8	1.9	1.4	1.7	1.4	1.2	1.1
37.5	2.9	2.0	1.5	1.8	1.5	1.2	1.1
40.5		2.1	1.5	1.8	1.5	1.2	1.1
43.5		2.2	1.6	1.9	1.6	1.3	1.1
46.5		2.3	1.7	2.0	1.6	1.3	1.2
49.5		2.7	1.8	2.2	1.7	1.4	1.2
52.5			2.1	2.6	1.9	1.5	1.3

V Ballast

1. General

Ballast of the balance is composed of X CA type concrete blocks and a ballast cradle containing X CB type blocks or containing nothing.

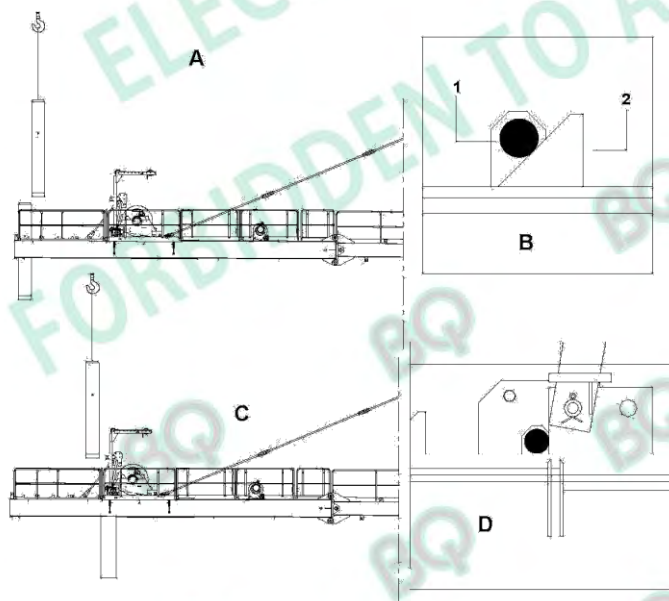
The ballast shall be installed from end of the balance arm (position having longest distance to the mast) (Drawing A).

The ballast is placed on bracket (1) in skew surface (Drawing B) to make sure that ballast blocks are locked to each other.

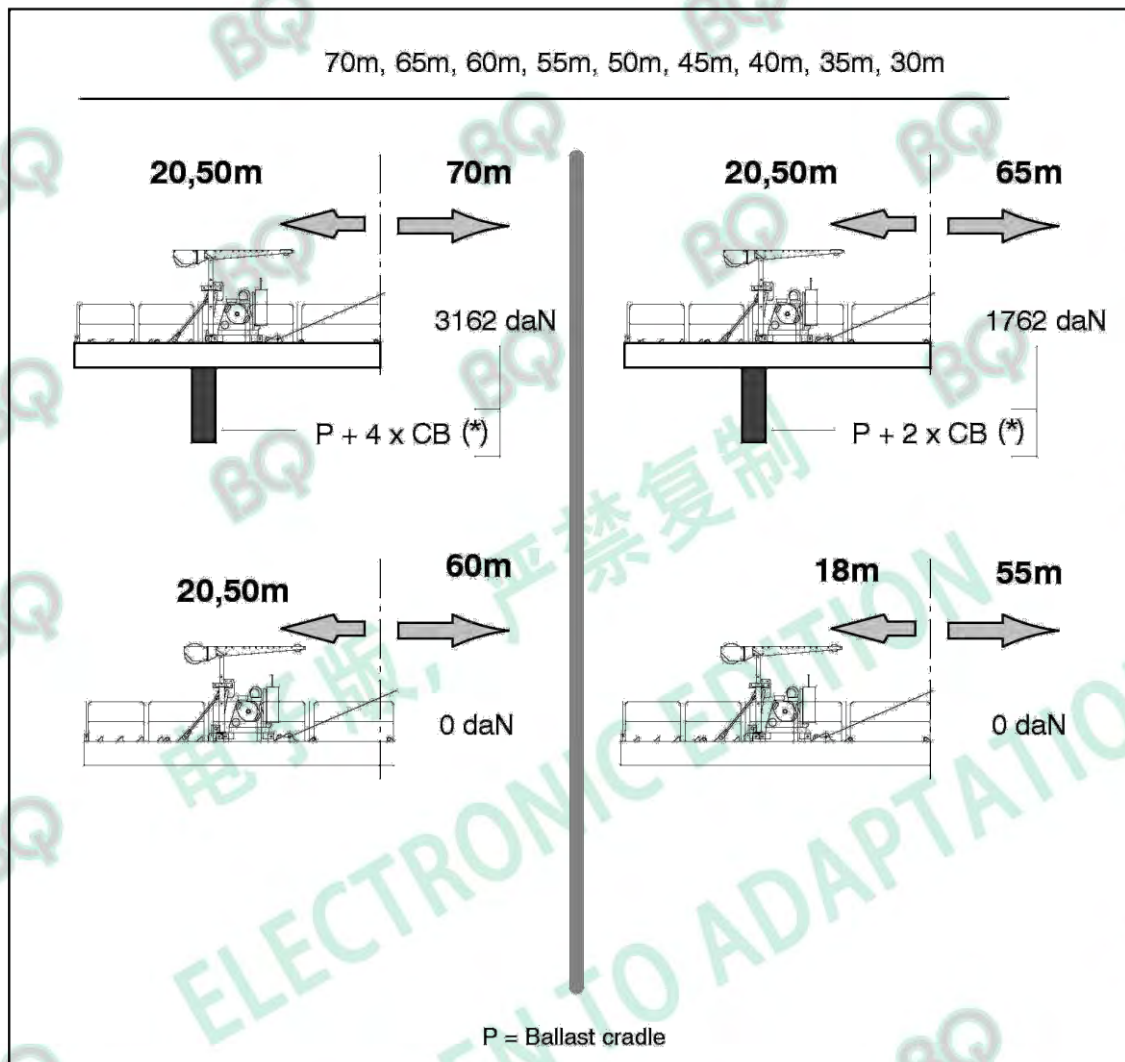
The ballast cradle is always located at extreme end of the balance arm.

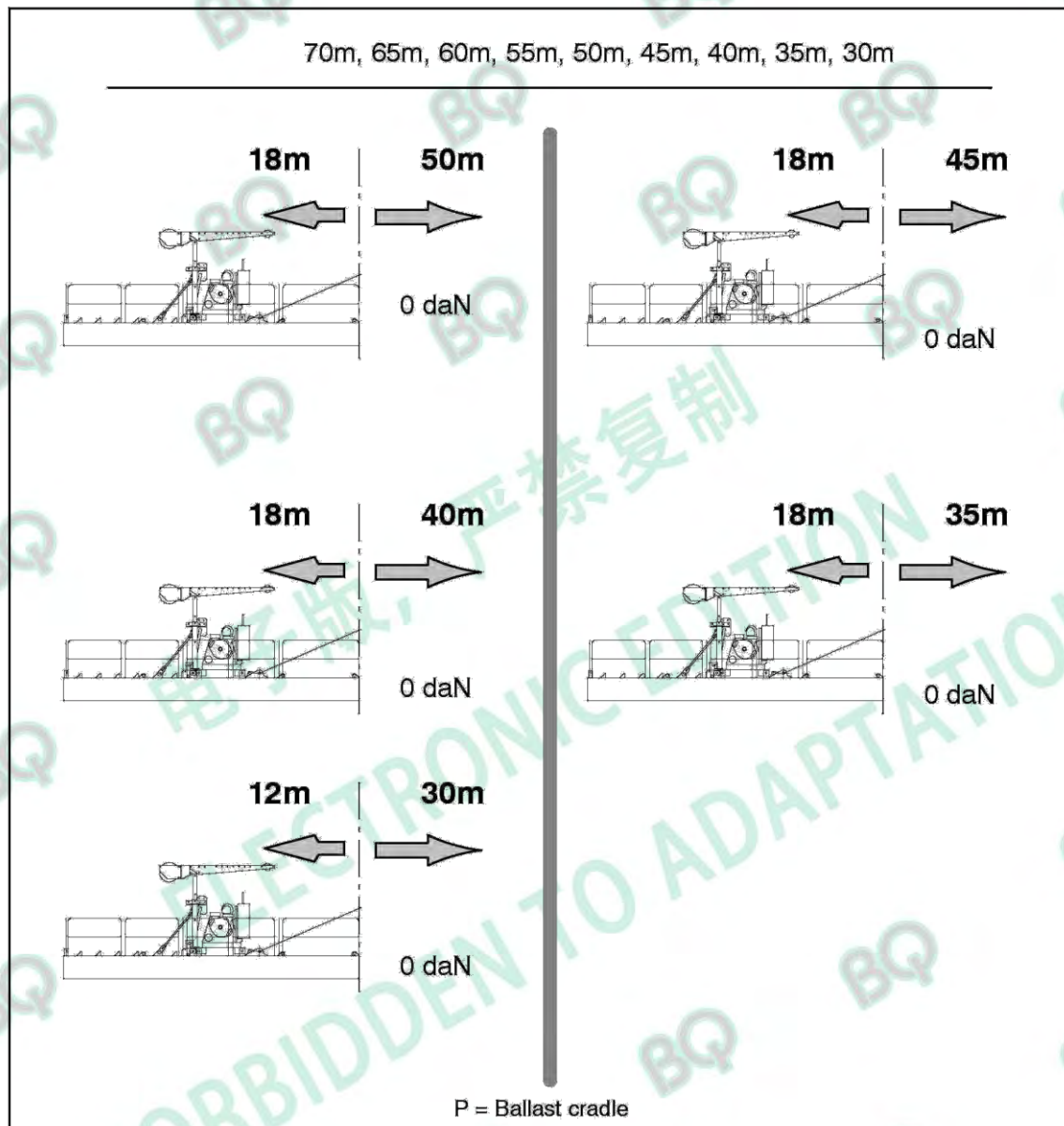
In case of partial ballast (before installation of the jib), place the ballast cradle at temporary position (close to the tower head as much as possible) (Drawings C and D).

Composition and number of ballast blocks are given hereinafter; while composition and number as well as position of ballast blocks (partial ballast) before installation of the jib are given in table below, and those (final ballast) during operation of the crane are provided in table below.

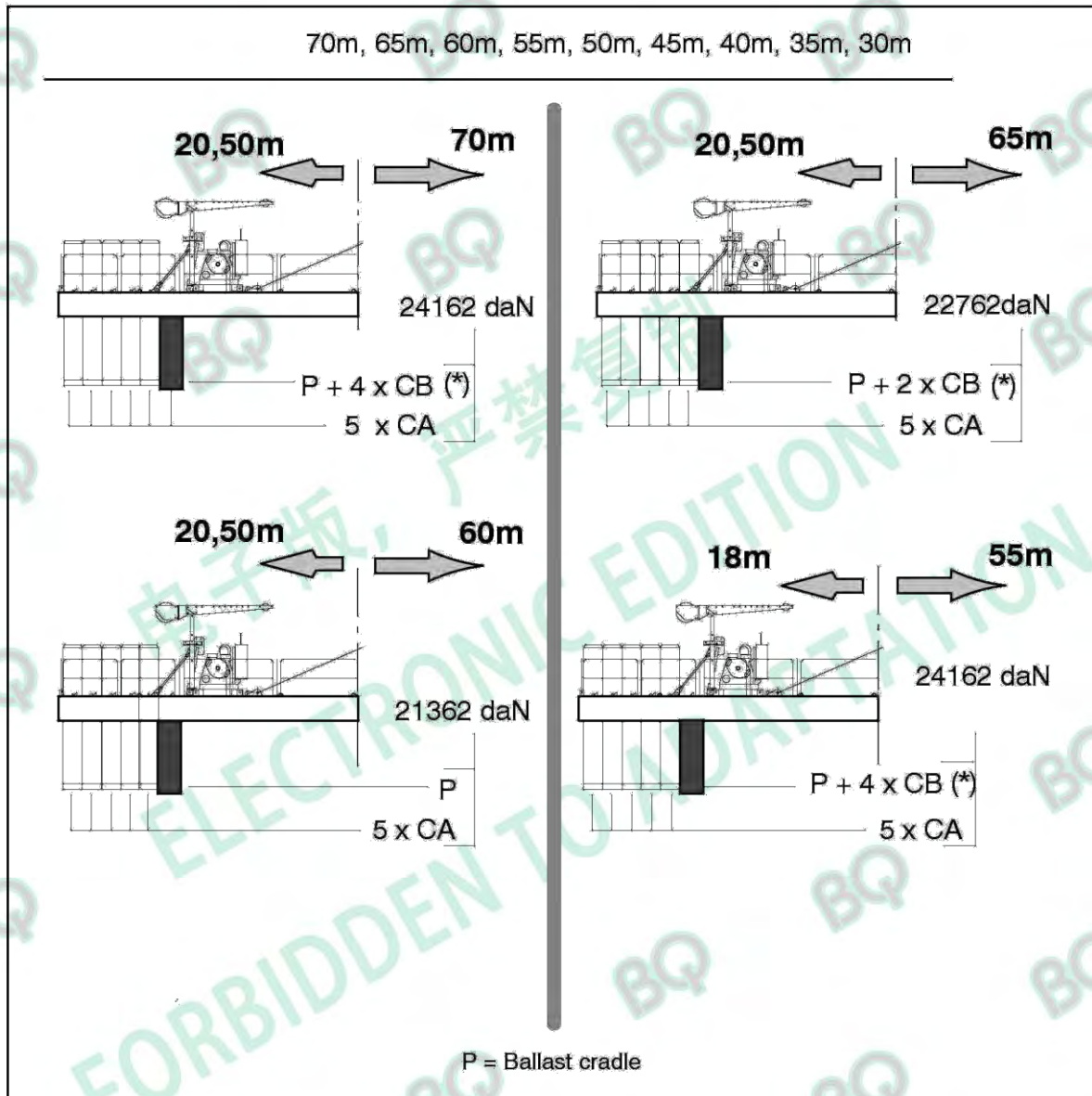


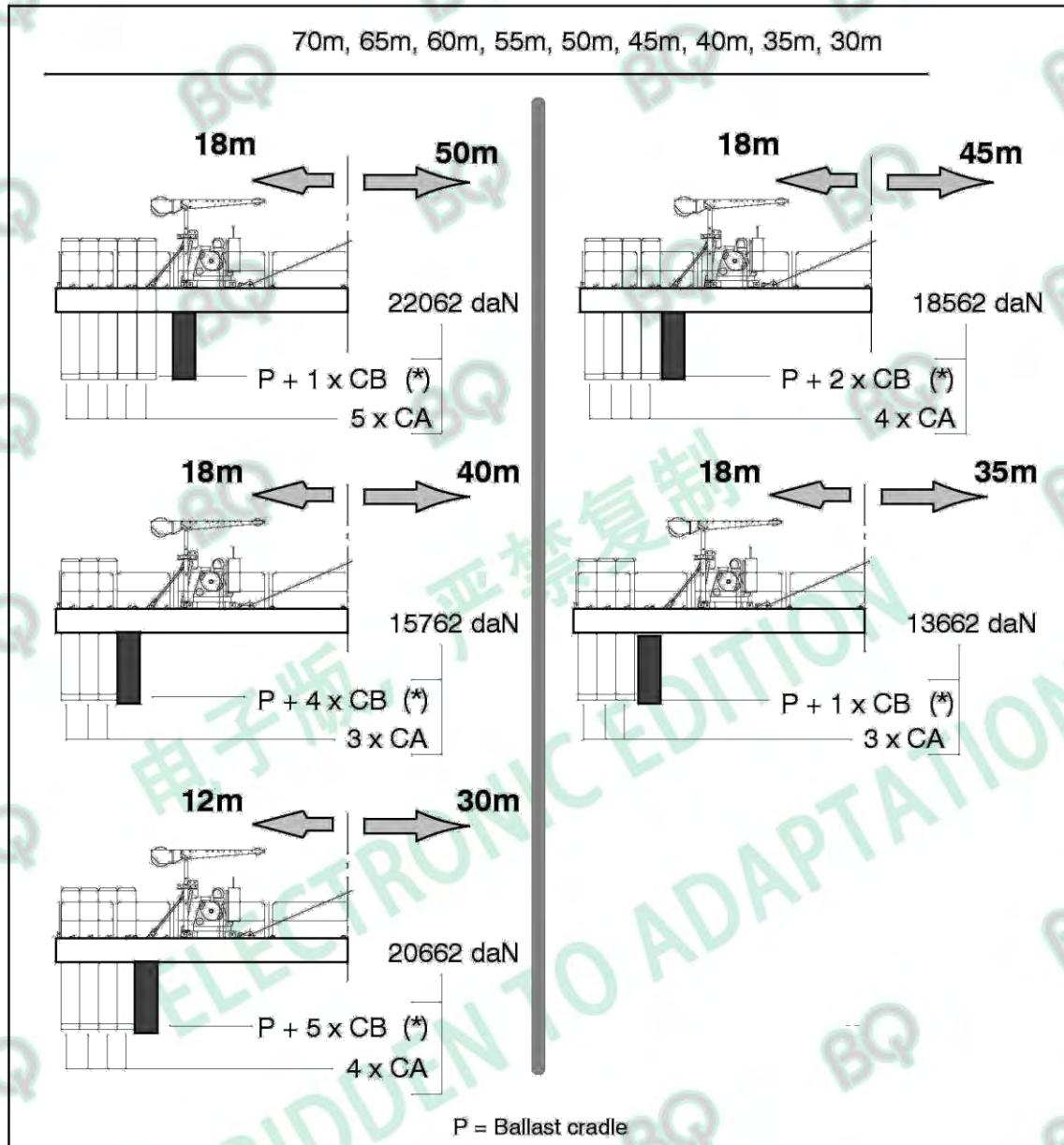
Ballast (12t) before jib installation (partial ballast)





Ballast (12t) during operation (final ballast)





2. Installation of Ballast Blocks with auto-crane

1 Preparation

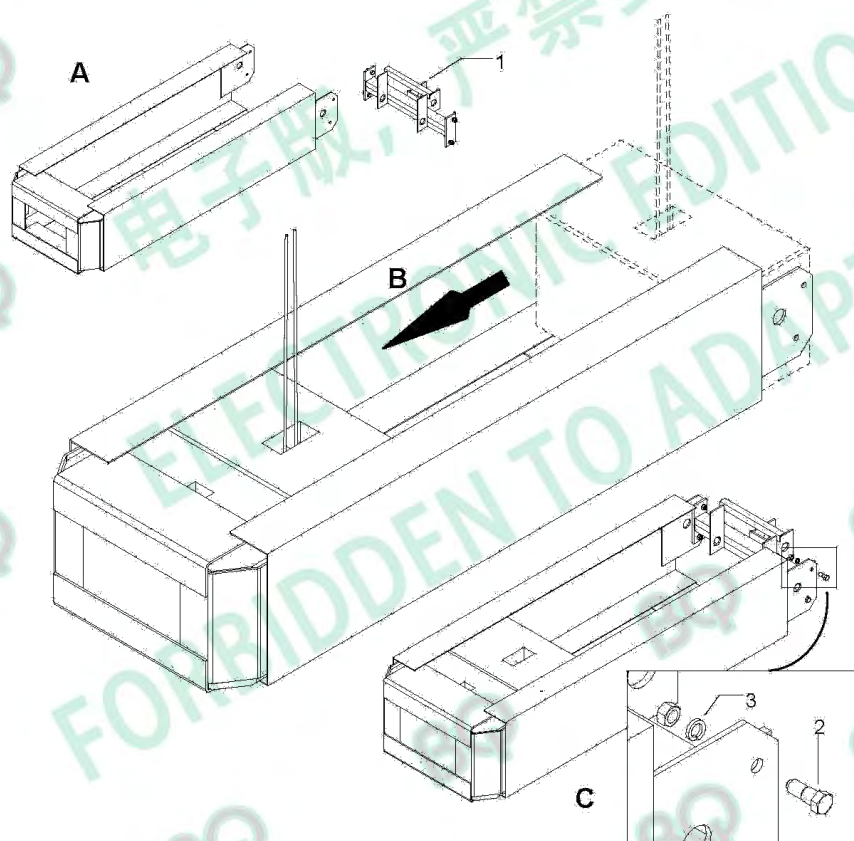
Preparation for counterweight is mainly to check if mounting shaft of ballast blocks passes through the ballast blocks.

① Place the ballast blocks into the ballast cradle.

- Place the ballast cradle on the ground and remove cross beam (1) (Drawing A).
- Hoist the ballast blocks and place them into the ballast cradle completely (see

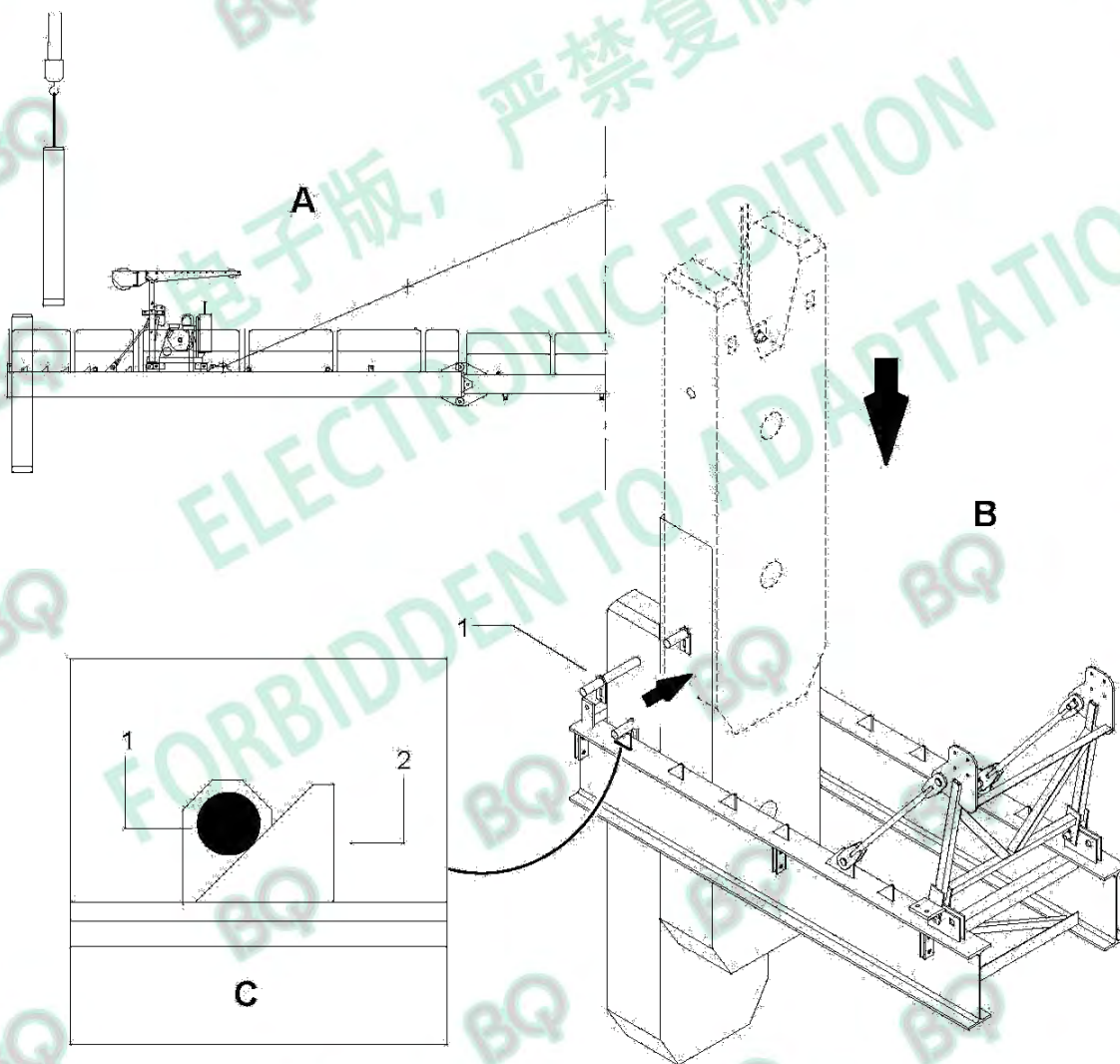
Drawing B).

- Repeat the operation above to hoist all of the ballast blocks.
- Re-install the cross beam removed with bolt (2) and washer (3) (Drawing C).



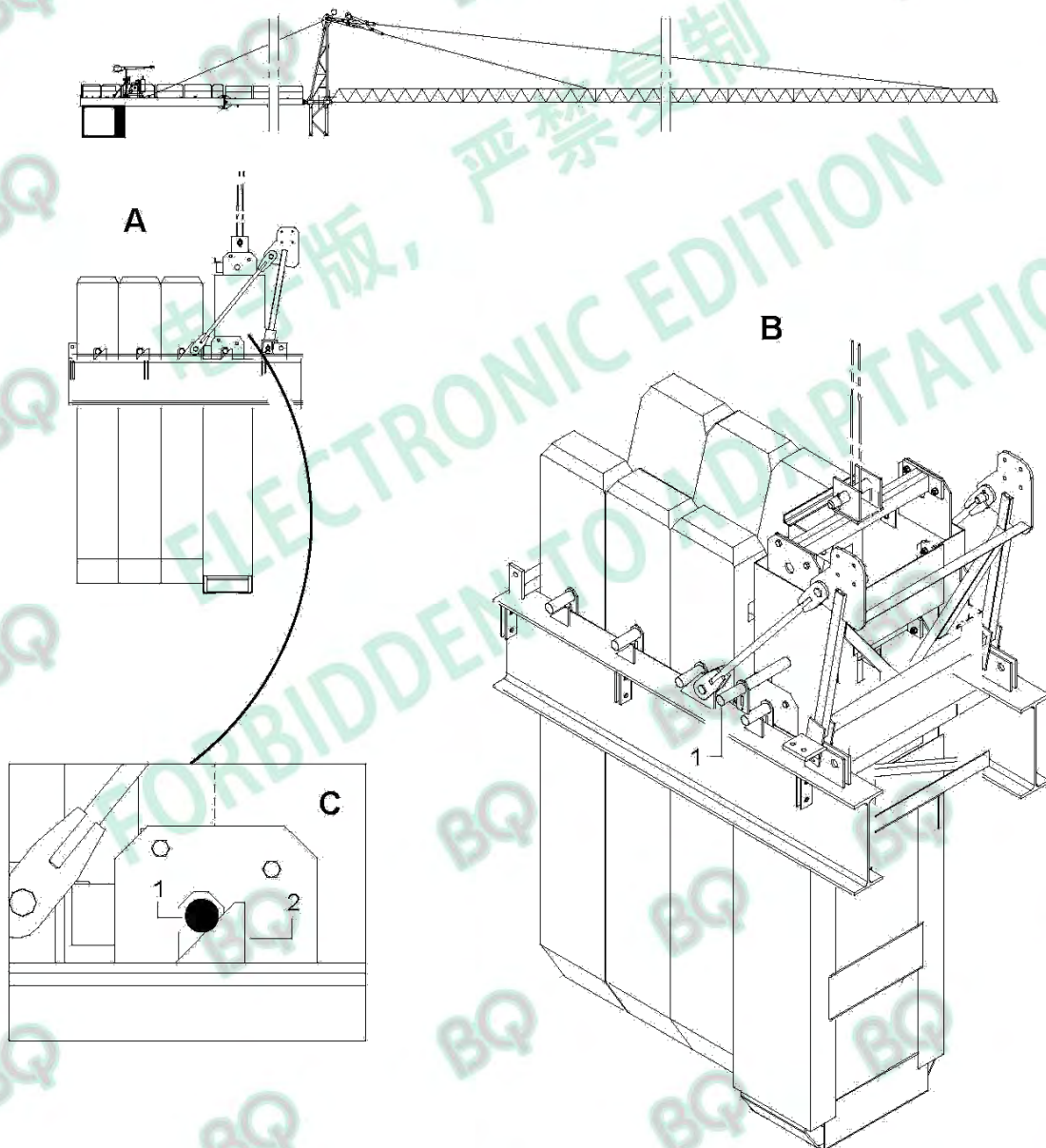
2 Installation of Ballast Blocks

- Hoist the ballast blocks with the crane cable and place them onto the balance arm (far away from the mast) (Drawing A).
- Insert pin roll (1) from side surface of the ballast blocks (Drawing B).
- Lower the ballast blocks to place pin roll (1) onto wedge (2) (Drawing C).
- Repeat the above operation to install next ballast block.
- Install the ballast cradle.



3 Installation of Ballast Cradle

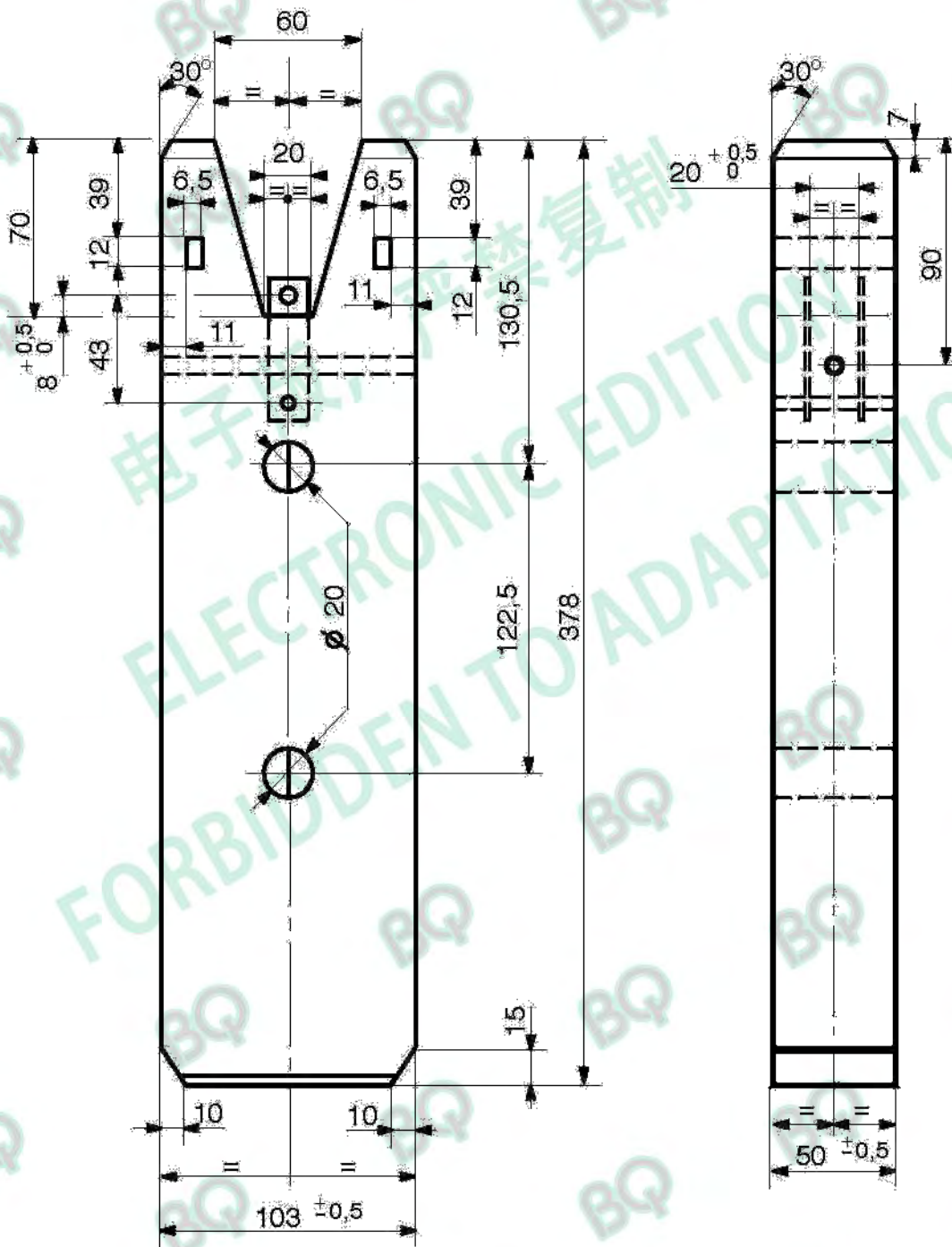
- Hoist the ballast cradle with the crane rope and place it onto the balance arm, make it tightly close to the concrete block final at last (Drawing A);
- Insert pin roll (1) from side surface of the ballast block (Drawing B);
- Continue to lower the ballast cradle to place pin roll (1) onto wedge (2) (Drawing C).



3 Manufacturing of Ballasts

1 Manufacturing CA of 4200daN ballast blocks

- Weight=4200daN—average density of the reinforced concrete is 2.35.
- Dimensions are in cm, and the tolerance is ± 1 cm



Steel bar breakdown of 4200daN ballast blocks

① Signs and description

2 HA 16×340

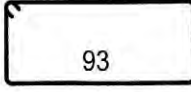
2: bar quantity

HA: high anchorage steel

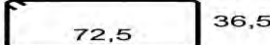
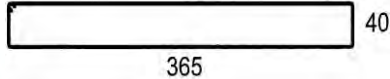
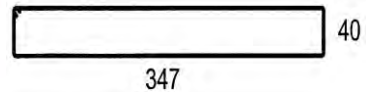
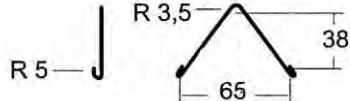
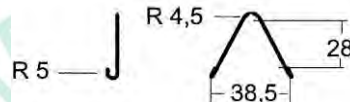
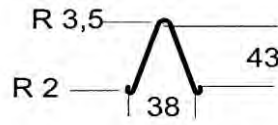
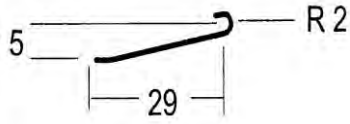
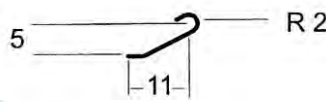
16: bar diameter (mm)

340: length (cm)

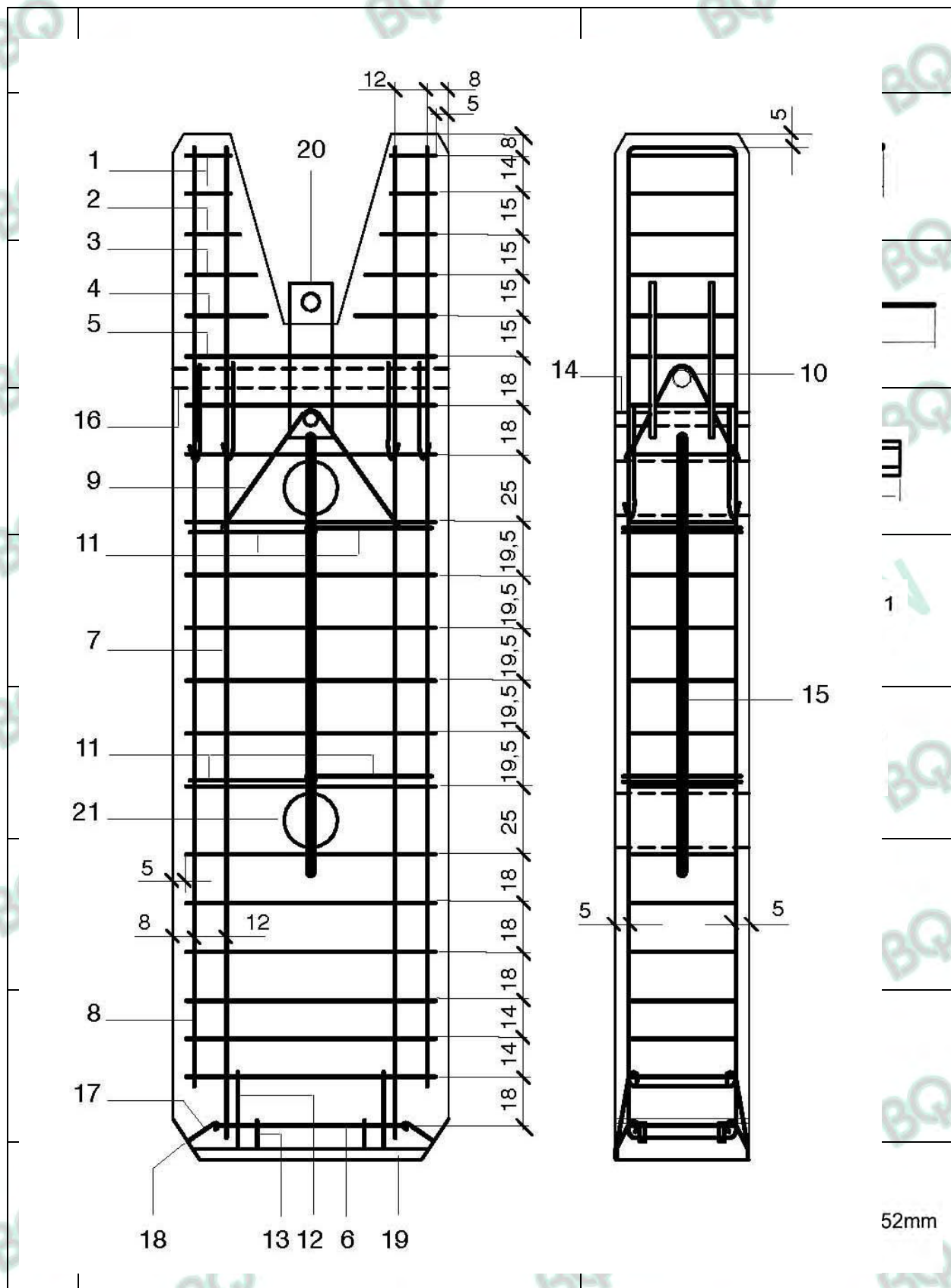
② Table of steel bar

S/N	Bar Description	Bar shape (unit: cm)
1	4 HA 16×112	16,5  36,5 *
2	2 HA 16×119	20  36,5 *
3	2 HA 16×129	26  36,5 *
4	2 HA 16×138	30  36,5 *
5	15 HA 16×265	 93 36,5 *

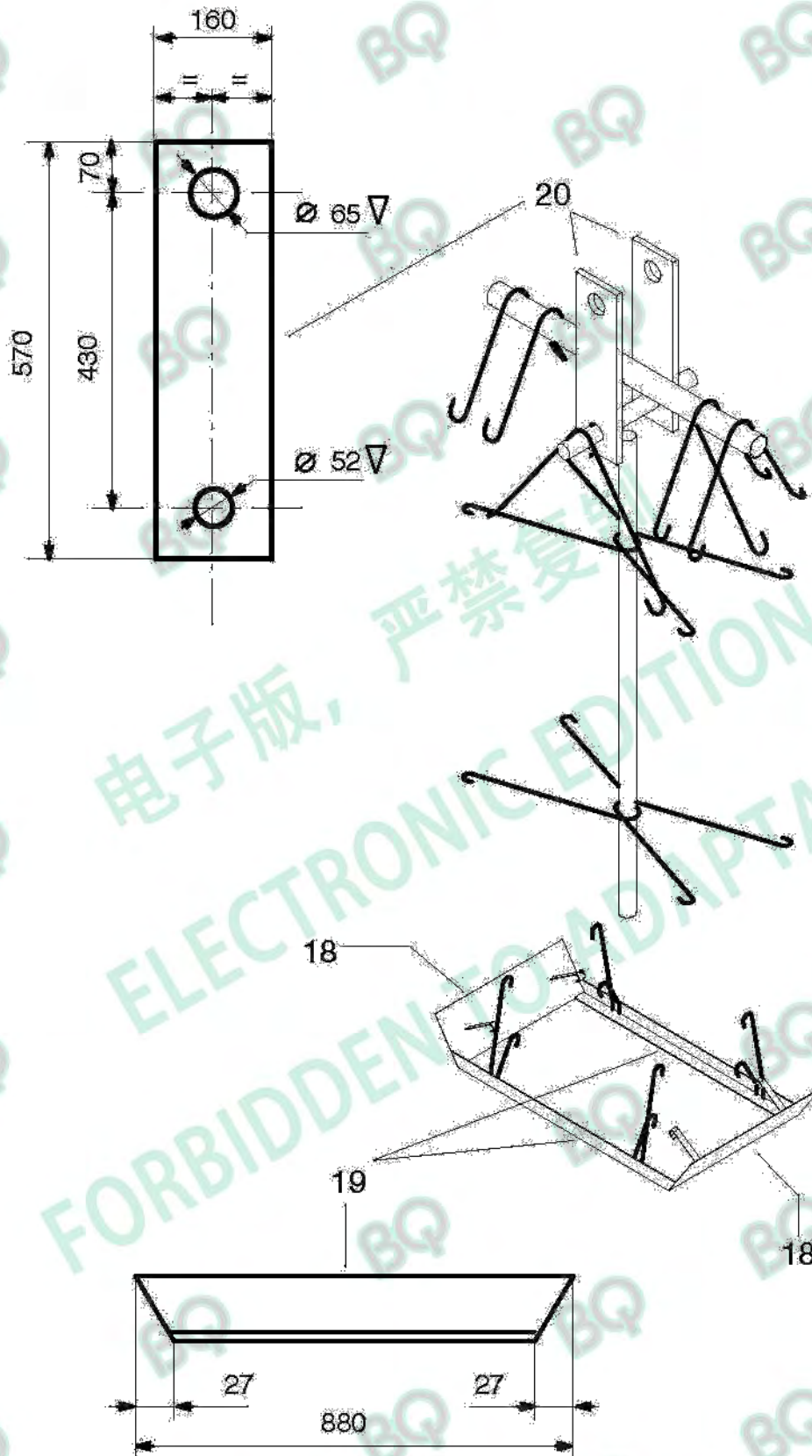
*External dimension (cm)

S/N	Bar Description	Bar shape (unit: cm)
6	1 HA 16×224	 *
7	2 HA 16×815	 *
8	2 HA 16×779	 *
9	2 HA 16×149	
10	4 HA 16×122	
11	4 HA 16×122	
12	4 HA 16×37	
13	4 HA 16×20	

*External dimension (cm)



③ Steel bar arrangement

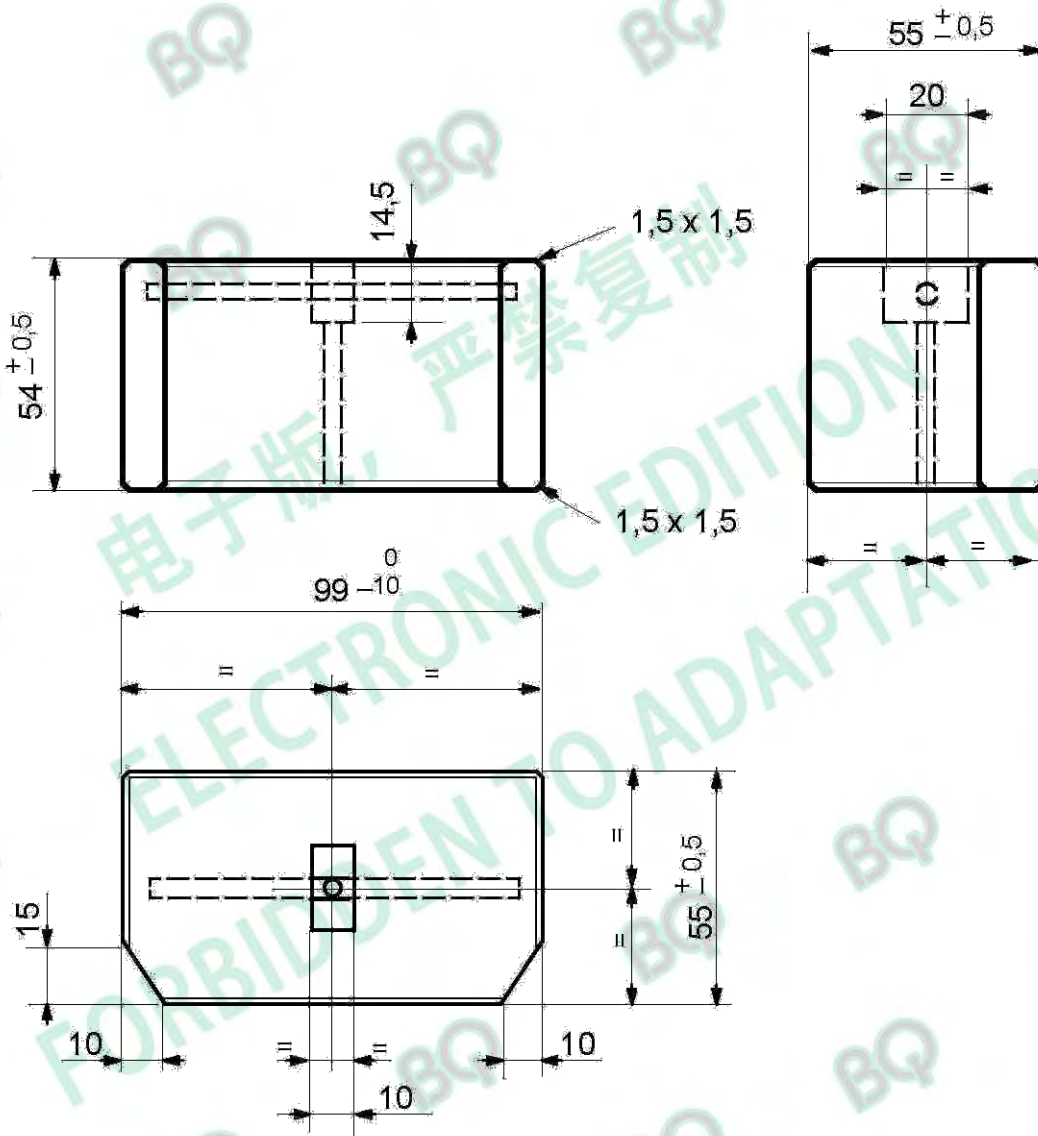


Dimensions in this page are in mm.

2 Manufacturing CB of 700daN ballast blocks

Diagram of ballast blocks

- Weight=4200daN average density of the reinforced concrete is 2.35.
- Dimensions are in cm the tolerance is ± 1 cm



Steel bar breakdown of 700daN ballast blocks

① Signs and description

2 HA 16×340

2: bar quantity

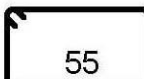
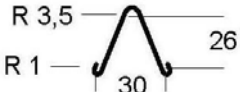
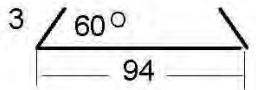
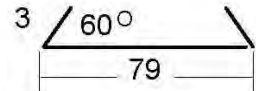
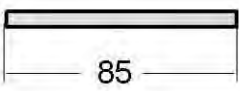
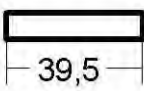
HA: high anchorage steel

16: bar diameter (mm)

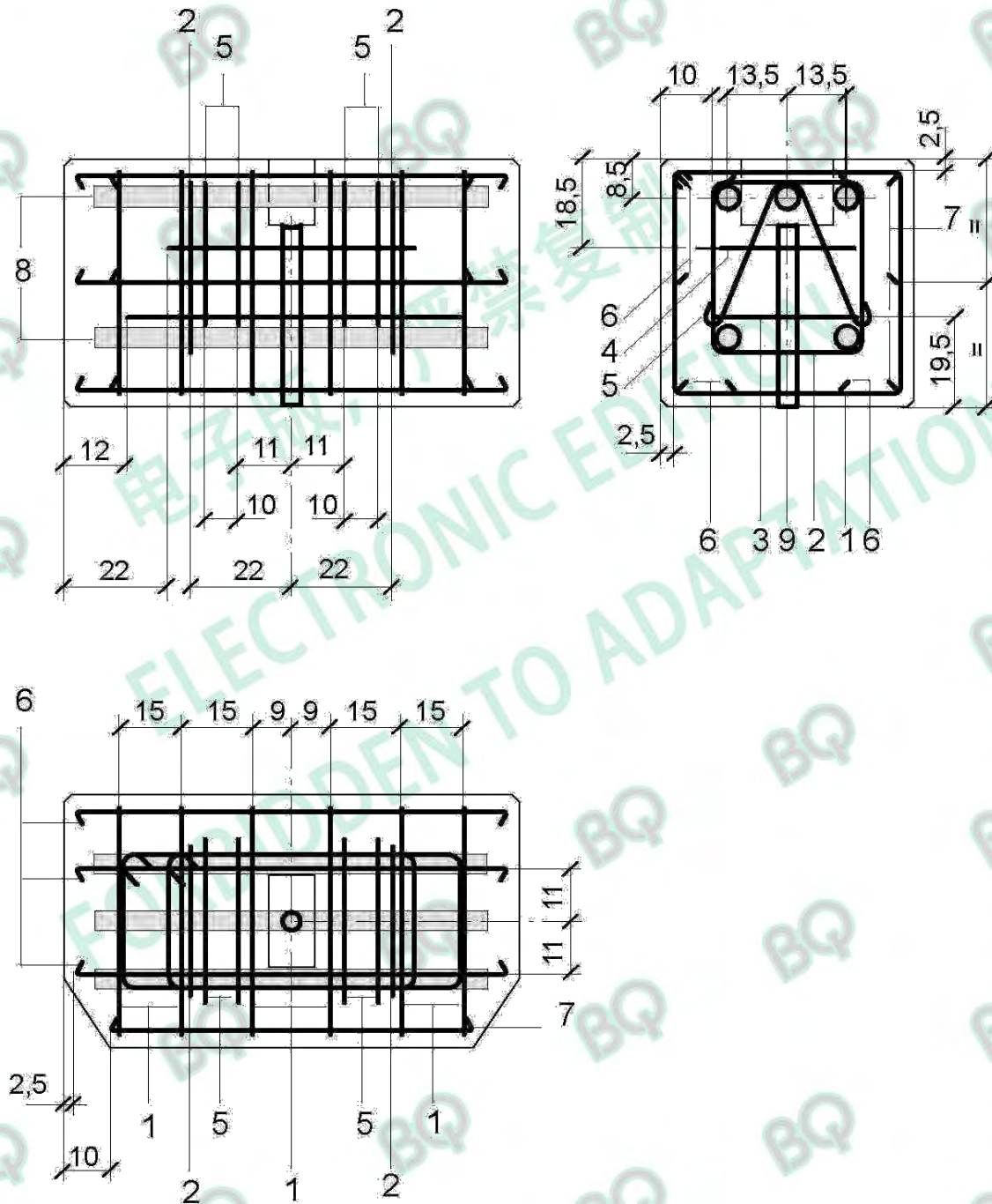
340: length (cm)

② Table of steel bar

*External dimension (cm)

S/N	Bar Description	Bar shape
1	6 HA 8 × 205	 49 *
2	2 HA 16 × 165	 38,5 *
3	1 HA 16 × 223	 30,5 *
4	1 HA 16 × 183	 30,5 *
5	4 HA 16 × 90	
6	7 HA 8 x 100	 *
7	3 HA 8 x 86	 *
8	5 round steelsΦ50mm, L= 85 mm Q235B	
9	1 PVC pipe Φ30mm L=39.5mm	

③ Steel bar arrangement



VI Anchorage

1 General

When exceeding the traveling or stationary height, the crane must be connected to the ground through ropes or connected to buildings through a solid anchorage frame.

For anchorage application of crane with chassis, please consult with us.

This description just involves solid anchorage on buildings, for connecting method of ropes, please consult our after-sale service department.

1.1 General Rules

- Put the crane in place

In case of traveling crane with chassis, drive it to a fixed position and tighten the rail clamping device to remove power supply of the traveling mechanism. For special conditions related to it, please consult with us.

- Under some conditions, another mast section shall be jacked for installation of the anchorage frame.

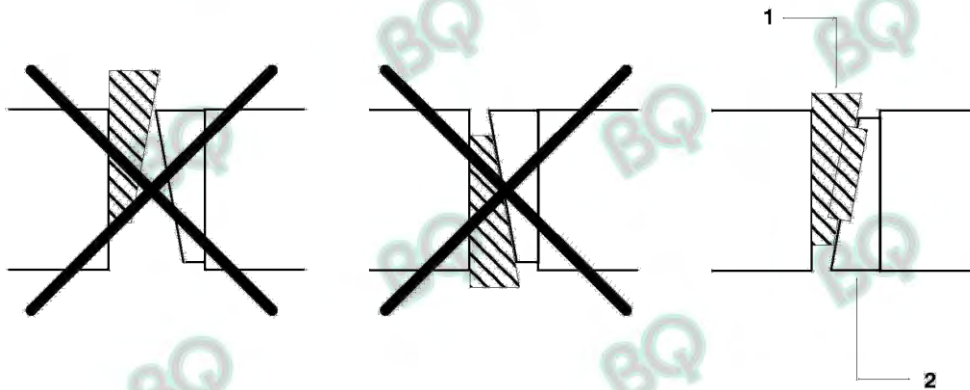
Special note:

Under such conditions, the crane is not at the normal independent height any more, and it is prohibited to make the crane at non-operation and free status.

During jacking, check perpendicularity of the tower crane from two surfaces, avoiding distance deviation between the mast and buildings.

Rule:

In order to ensure correct connection between the mast and anchorage frames and avoid drop of wedge (1), and part (2) with welded wedge on the anchorage frame must be arranged in correct direction to obtain good connection.

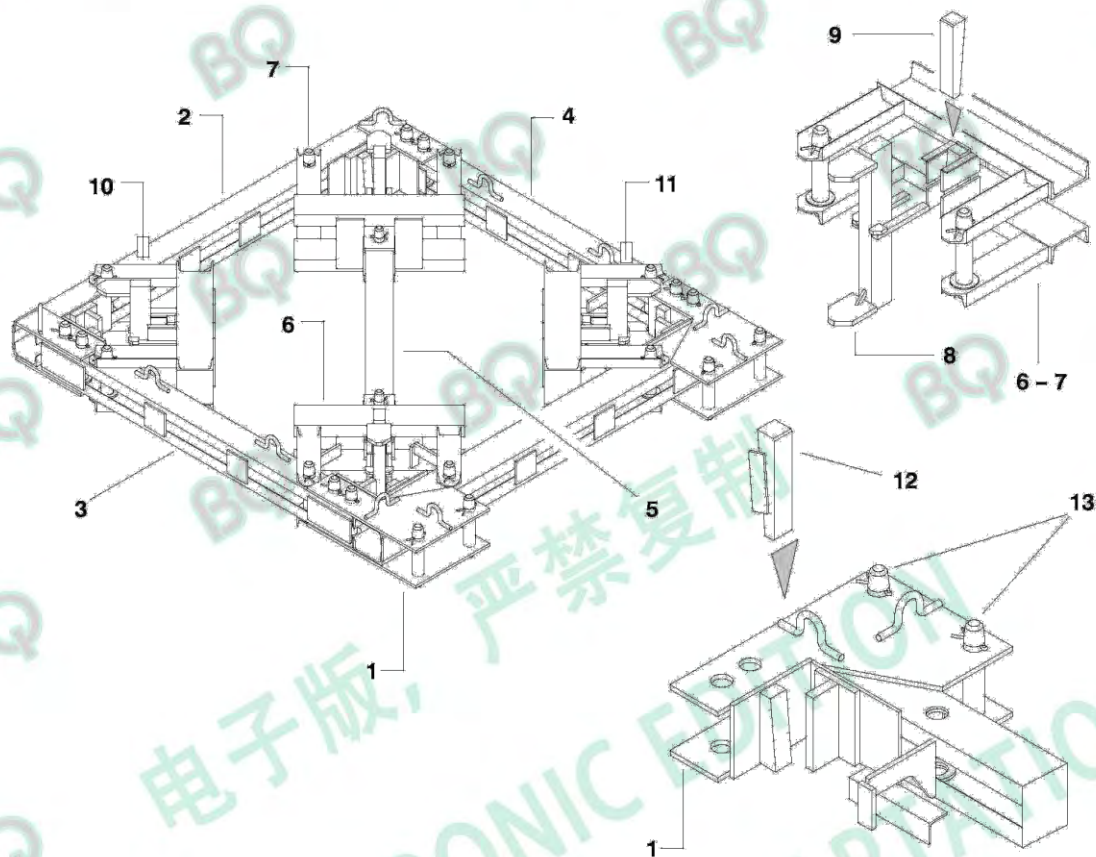


2 Description and Dimension of Anchorage Frame

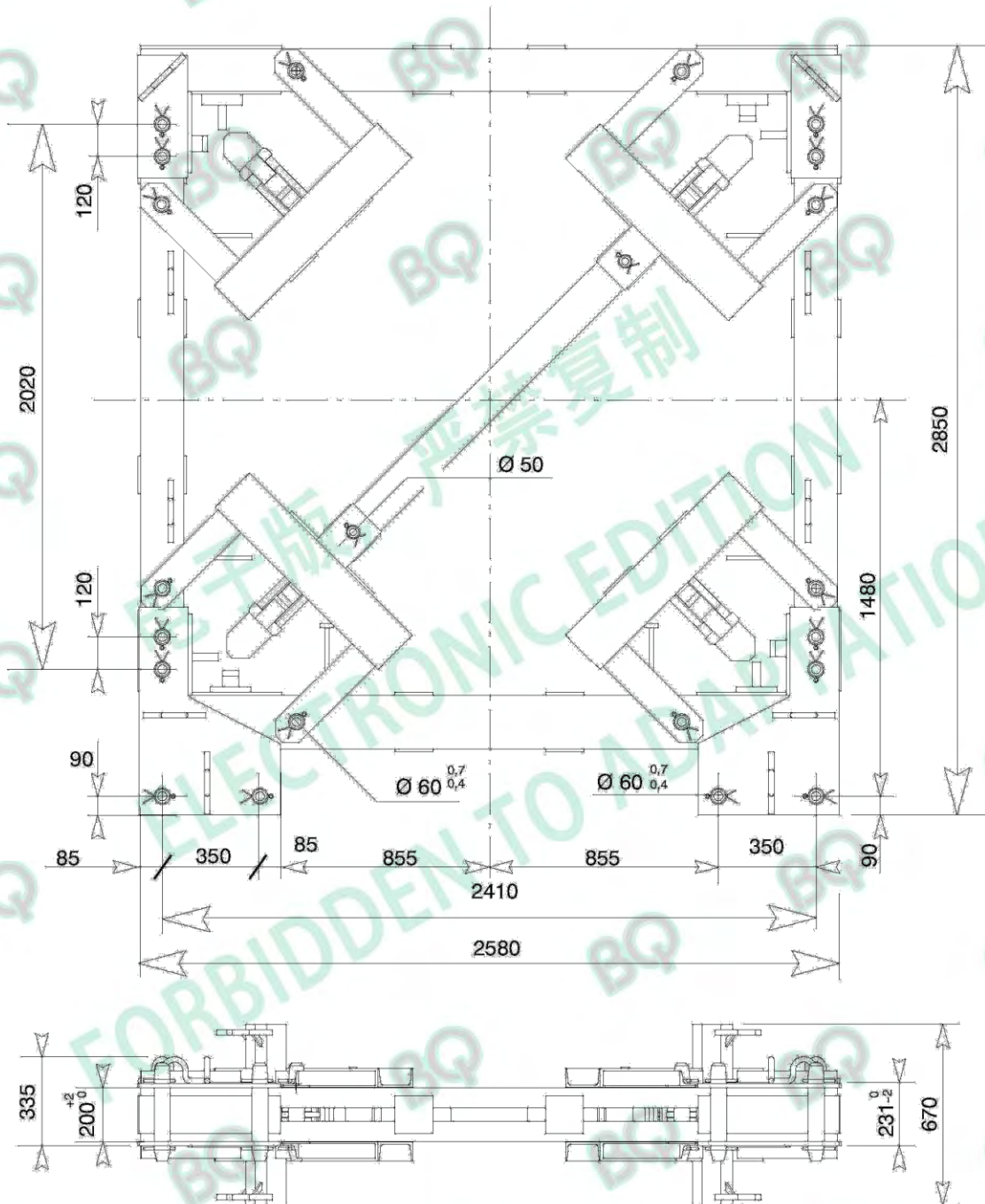
The whole set of anchorage frame includes:

- 1 front beam (1)
- 1 rear beam (2)
- 2 side beams (3) and (4)
- 1 cross frame (5)
- 2 clamp plates (6) and (7), with 2 pads (8) and 2 pads (9) on it, installed on cross frame (5)
- 2 clamp plates (10) and (11), 4 fastening wedges (12) and several fixed pins.

The front beam has 4 holes through which pin roll (13) can connect the anchorage frame with the building.

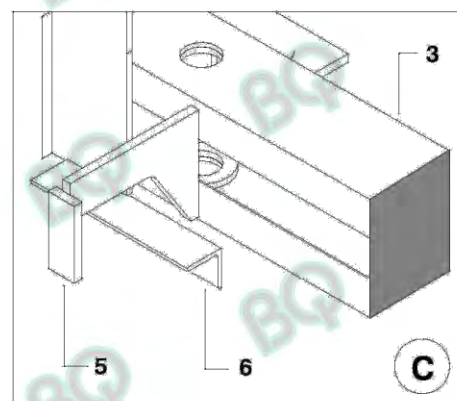
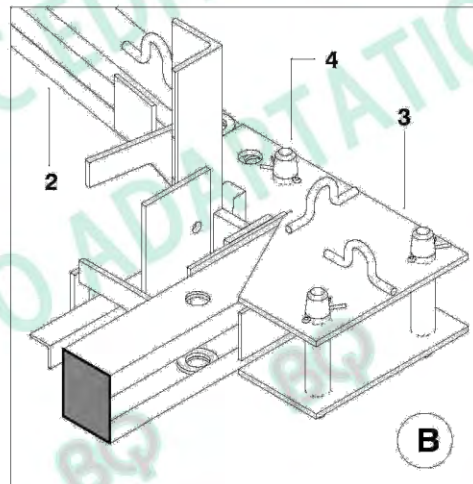
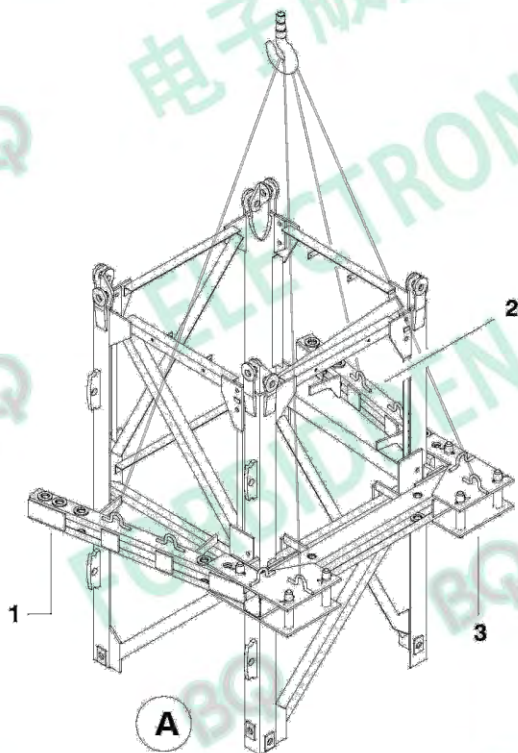


Main dimension of 2m anchorage frame

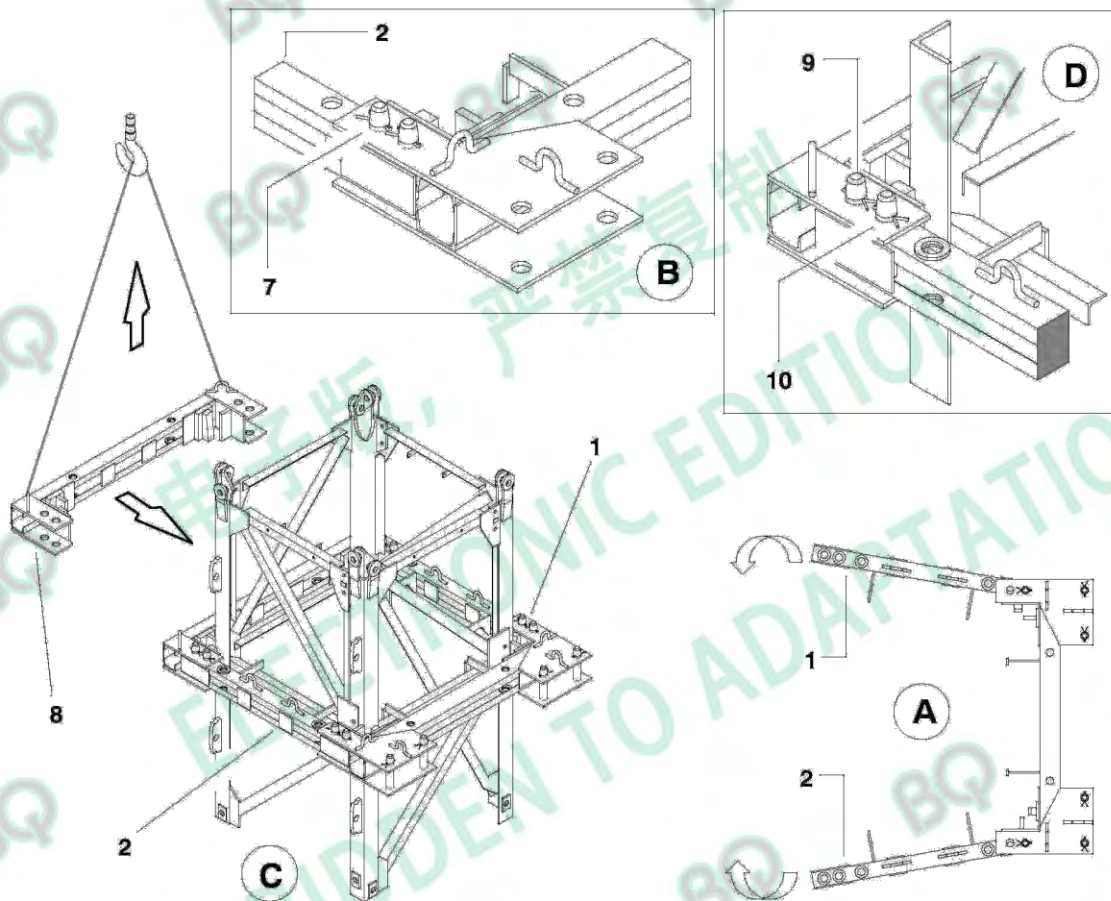


3 Installation of 2m Anchorage Frame

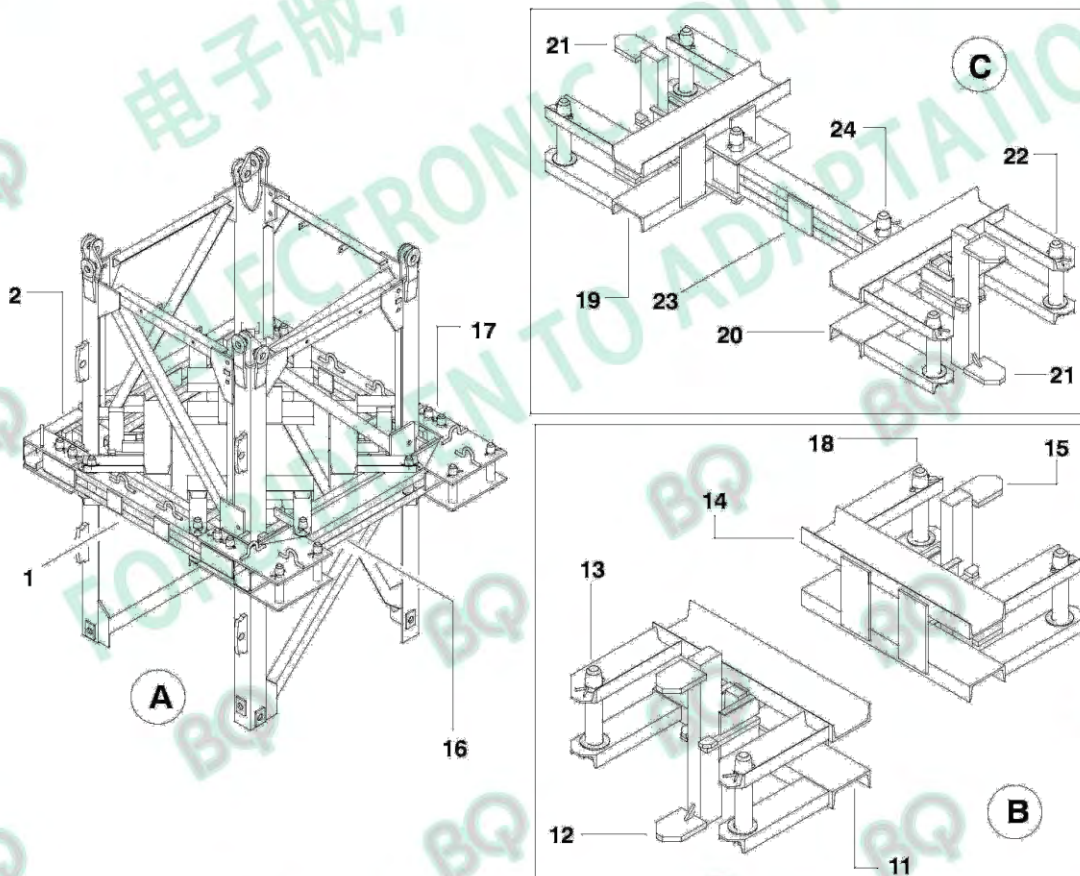
- Remove the standard ladder from the mast section connecting with the anchorage frame.
- Install side beams (1) and (2) on to front beam (3) on the ground (insert pin roll (4) only to adjust clearance between beams (1) and (2)) (Drawings A and B).
- Hoist the assembly onto preset position in the mast (toward connecting piece (3) of anchored beam of the building-side) (Drawing A)
- Use two ropes to guide the crane in place.
- Tightly press gusset plate (5) of front beam (3) onto horizontal support in middle of the mast section (Drawing C)



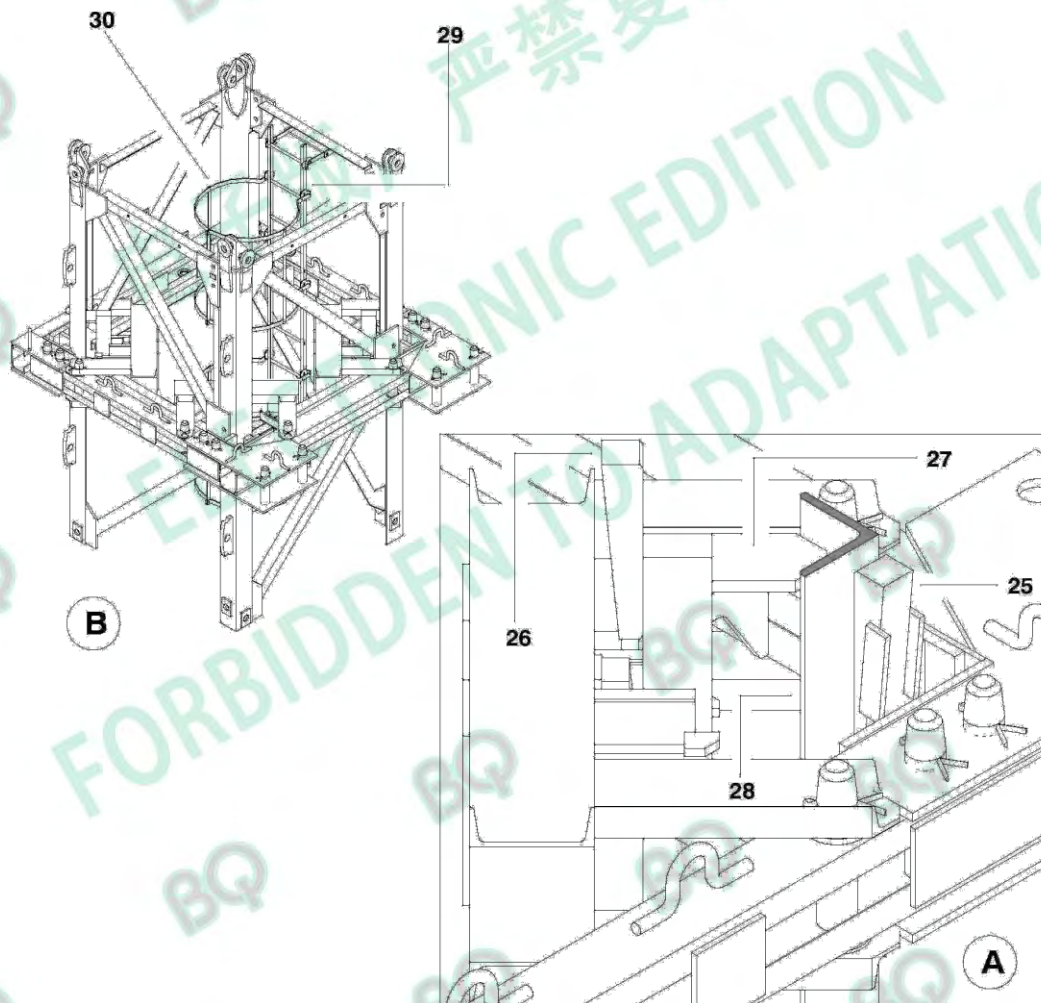
- Close side beams (1) and (2), insert pin roll (7) (Drawings A and B)
- Hoist rear beam (8) in place and fix it onto side beams (1) and (2) with pin rolls (9) and (10) (Drawings C and D)



- Hoist clamp plate (11) with cushion block (12) and put it in place, use pin roll (13) to fix it onto beams (1) and (2), insert cotter pin (Drawings A and B).
- Hoist clamp plate (14) with cushion block (15) and put it in place, use pin roll (18) to fix it onto beams (16) and (17), insert cotter pin (Drawings A and B).
- Hoist clamp plates (19) and (20) with cushion block (2) and put them in place, use pin roll (22) to fix them onto beams (16) and (17), insert cotter pin (Drawings A and B).
- Install and cross frame (23) and tighten it with pins, use pin roll (24) to fix them onto clamp plates (19) and (20) (Drawing C).



- Check levelness of the anchorage frame, and correct it in case of unevenness.
- Place outer wedge (25) and knock it to make the anchorage frame contact with main chord of the mast section (Drawing A).
- Place inner wedge (26) and knock it to make cushion block (27) tightly stick on inner side of main chord of standard section (28) (Drawing A).
- After operation above, check part between the wedge and main chord of the mast section which shall be free of gap.
- Install escalator (29) on the standard escalator position and install two sections of retaining ring on it (Drawing B).



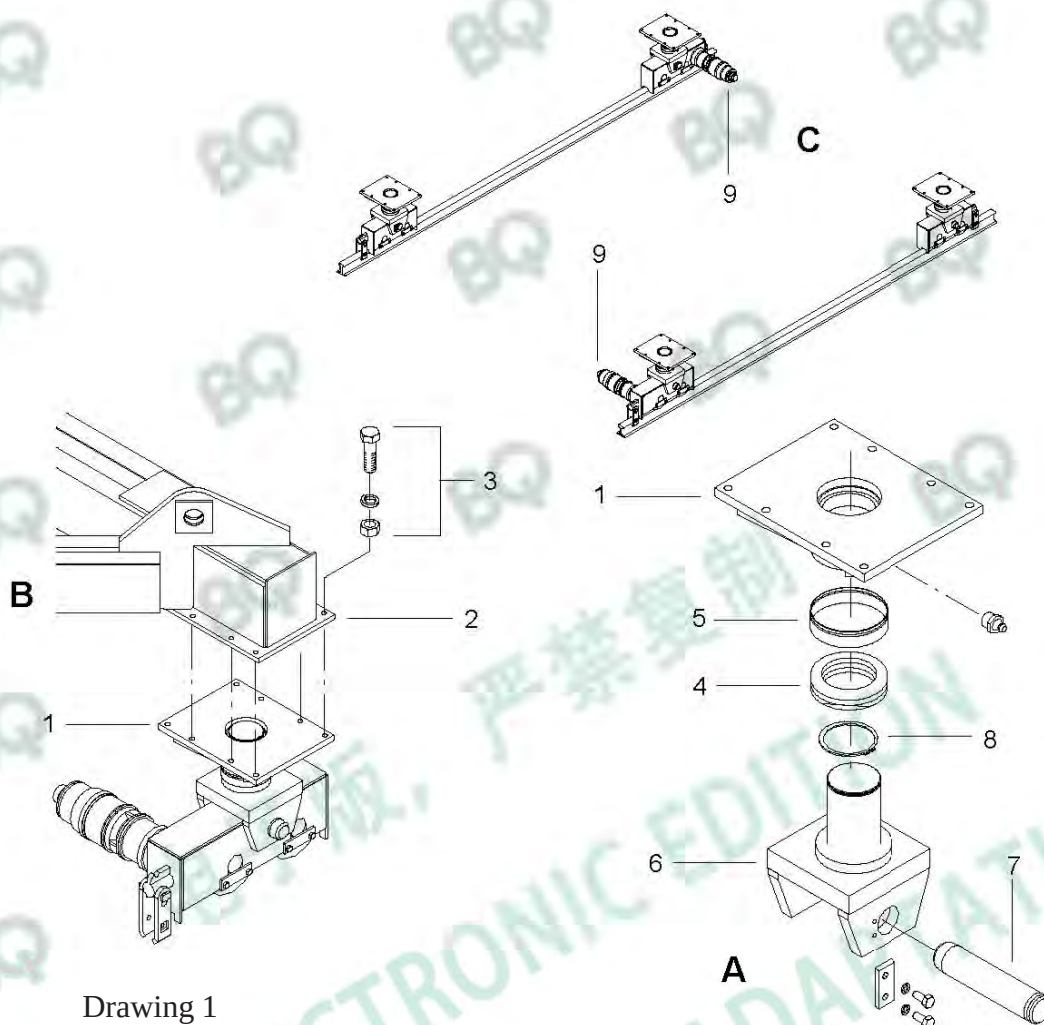
Part II Tower Erection

I Installation of Trolley on Tracks

1 Devices on the straight track are composed of four equal units and each of them comprises:

- A tray (1), which is connected below base frame (2) through bolts, washers and nuts (3).
- A thrust ball bearing with dust cap (5).
- A support (6) connected to trolley.
- A shaft pin (7) connected to the trolley and support.
- A retaining ring (8), which fix the support onto the tray and allows for vertical jump of 30mm (Drawing 1-Detail Drawings A and B).

Note: in case of traveling through two active trolleys, place the two active trolleys onto the track with large bending radius (Drawing 3-Detail Drawing F). In case of no reference, place the two active trolleys onto fixing support legs diagonally.



Drawing 1

2 Device on Bent Track

Device on bent track is composed of two units (A) and two units (B) equal to those on the straight track (Drawing 2-Detail Drawing F).

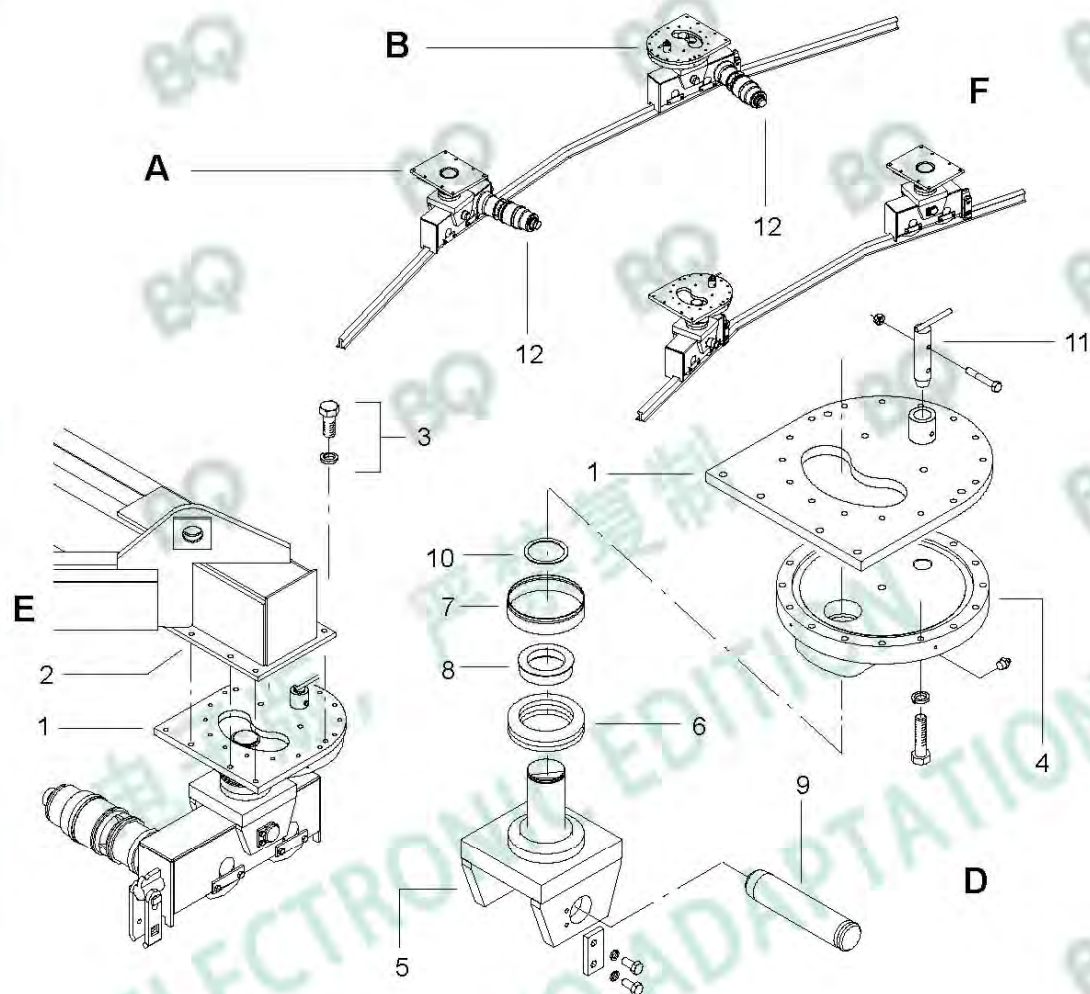
Each of units (B) comprises:

A tray (1), which is fixed below base frame (2) through bolts and washers (3).

A thrust ball bearing (4), including:

An external part (4) fixed on the tray.

A welding part connecting the support (Drawing 2-Detail Drawings D and E).



Drawing 2

A support (5) connected to trolley.

A thrust ball bearing (6) with dust cap (7).

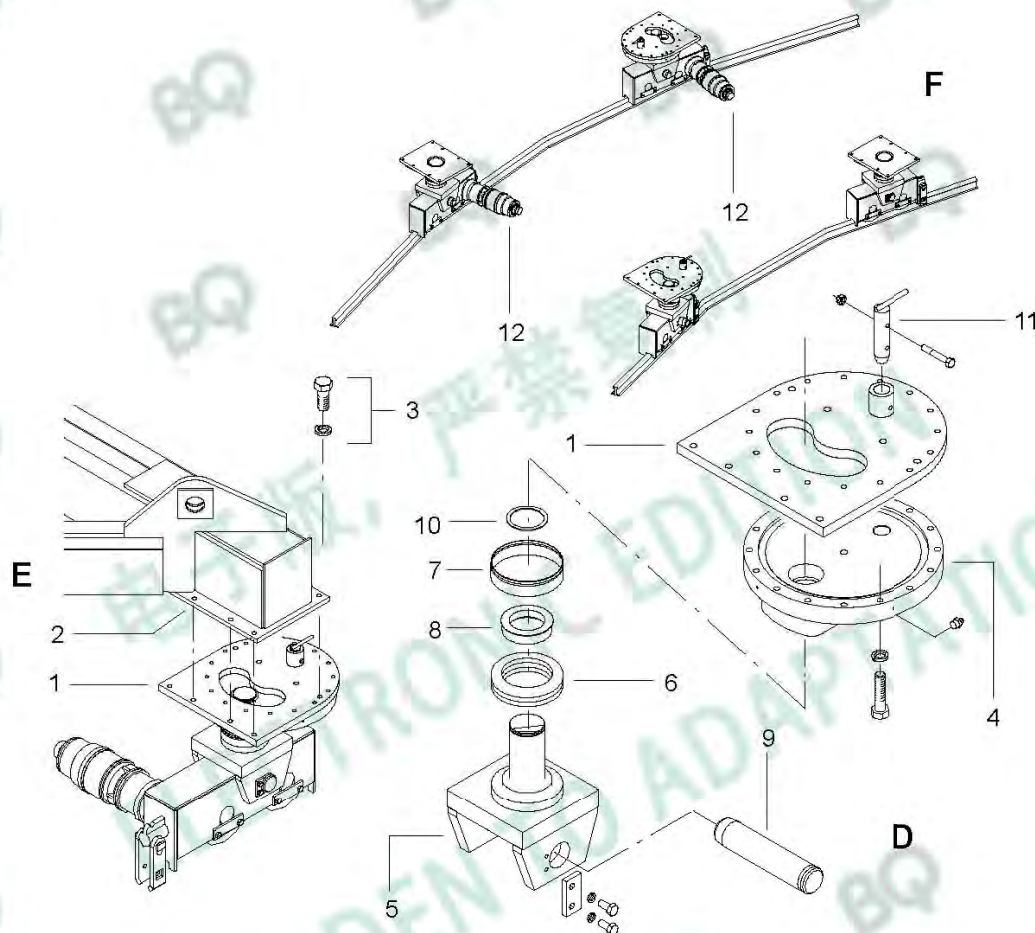
A retaining ring (8), which is used to fix thrust ball bearing (6) at end of the support.

A shaft pin (9) connecting the trolley/support.

A locking washer (10), which is used to fix support (5) onto thrust ball bearing (4).

A shaft pin (11), which is used to fix rotating center of thrust ball bearing (4) and used for traveling switch between the straight track or the 90° track (Drawing 3- Detail Drawings D and E).

Note: in case of traveling through two active trolleys, place the two active trolleys onto the track with large bending radius (Drawing 3-Detail Drawing F). In case of no reference, place the two active trolleys onto fixing support legs diagonally.



Drawing 3

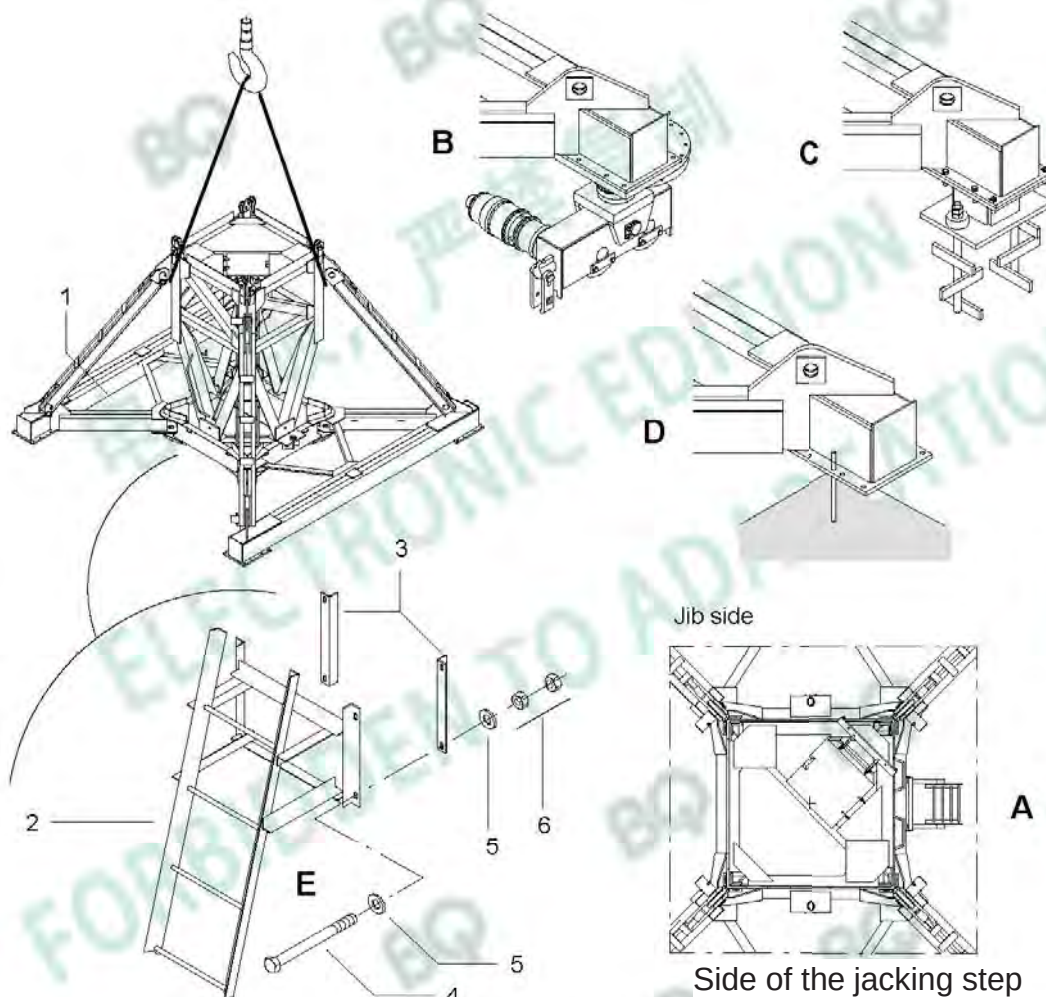
II Chassis Installation

- 1 Hoist chassis (1) with a crane cable to put it in place according to drawing below.
 - For traveling tower crane, place the chassis onto mechanism of the straight track or bent track (Drawing B).
 - For stationary tower crane, there are two possibilities:
 - It can be fixed by side board fixing device determined by the user onto cement support legs (Drawing C).

Or it can be placed onto four cement blocks, and outline dimension of the cement blocks is determined according to reaction of the crane and pressure intensity allowed on the ground and is leveled in advance (Drawing D).

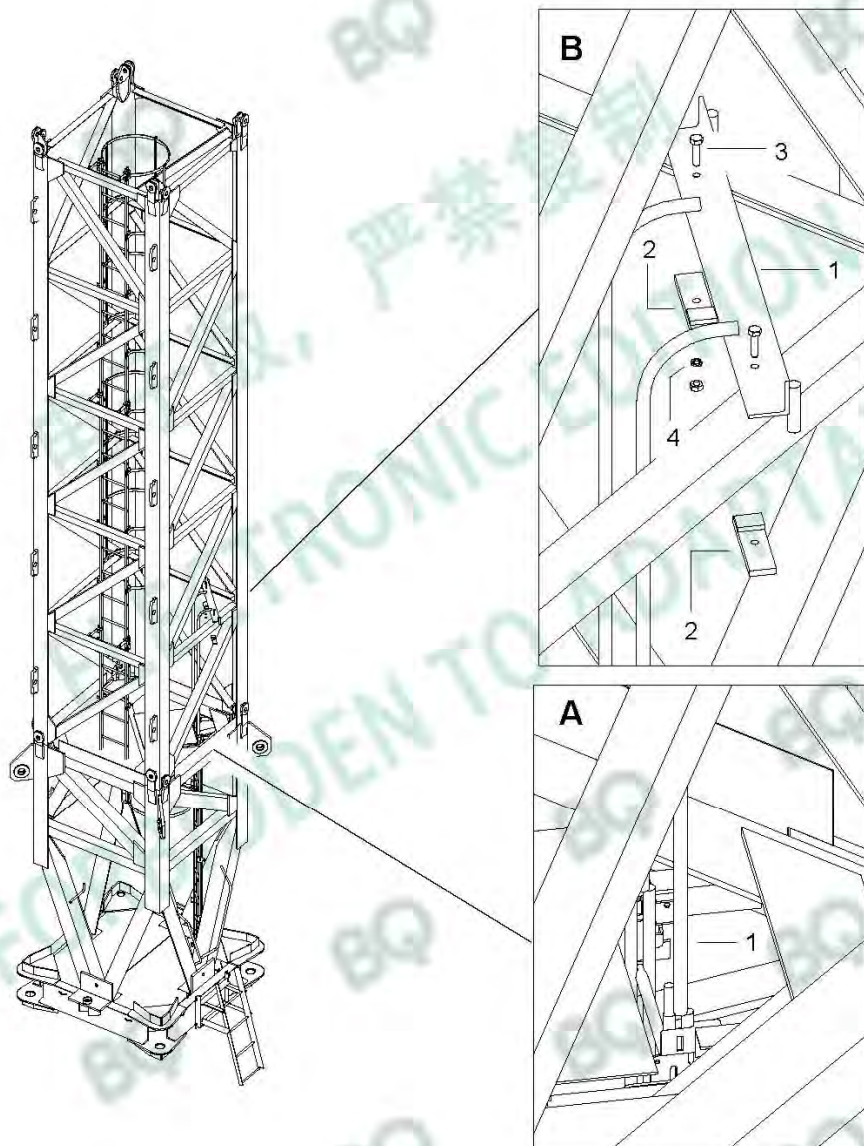
Install channel escalator (2), and fix the escalator onto the chassis with connecting plate (3), bolt (4), washer (5) and nut (6) (Drawing E).

Install electrical devices and refer to the operating instruction.



2 Additional Channel and Chassis of the Mast Section Channel

- Install escalator (1) of the mast section channel.
 - Insert support legs of escalator (1) of the mast section channel onto top of the base section escalator (Drawing A).
 - Fix other end of escalator (1) onto steel angle of the base section with fixing board (2), bolt (3) and washer (4).



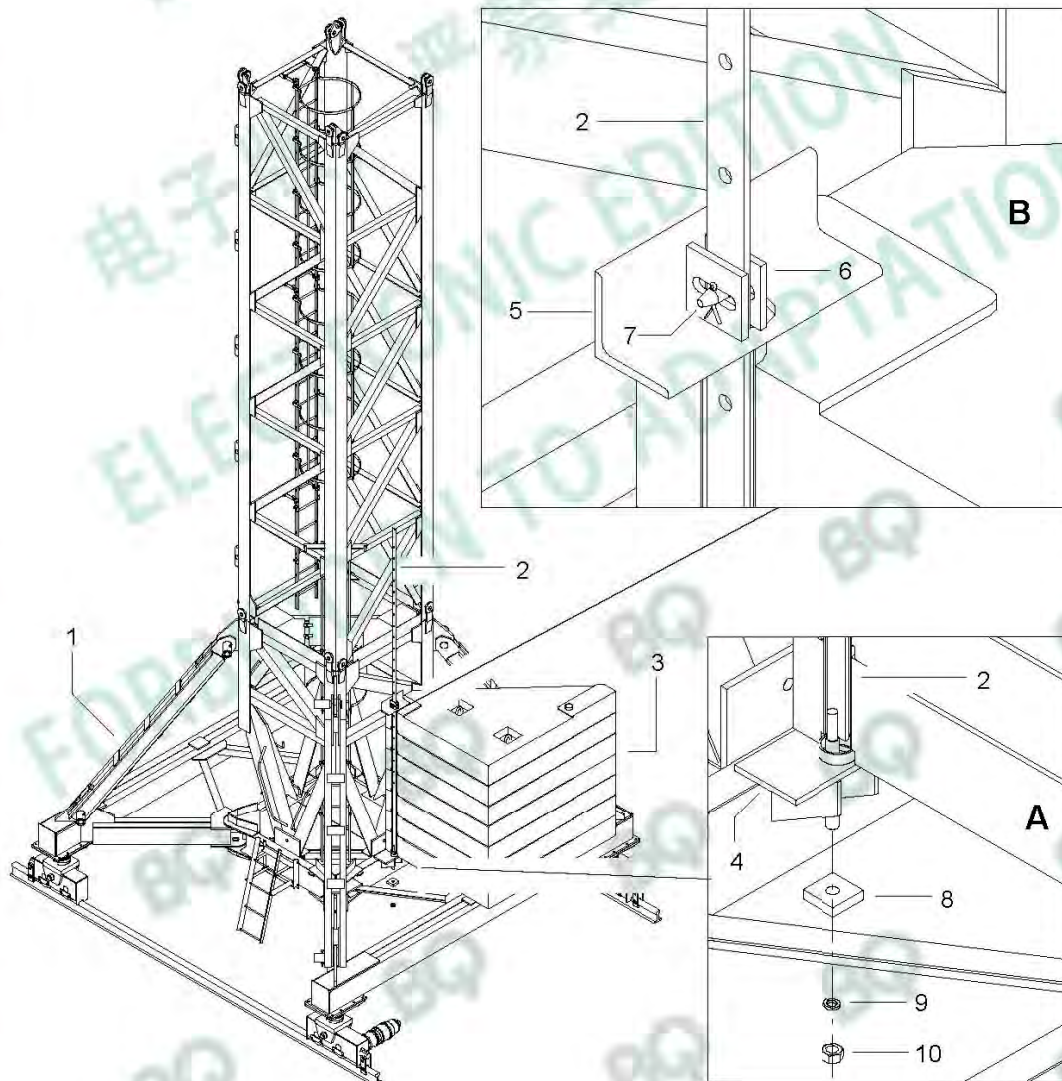
3 Ballasts on Chassis

3.1 Placement of Ballasts

- Place ballasts onto chassis (1) according to the position and weight specified.

3.2. Fixing of Ballasts

- Insert anchorage bar (2) into cement block (3), till its threaded part exceeds ballast support (4) of the chassis (Drawing A).
- Install cross beam (5) onto the anchorage bar, fix its upper part with plate (6) and shaft pin (7) and then insert it into a cotter pin (Drawing B).
- Fix the lower part with plate (8), washer (9) and nut (10) (Drawing A).

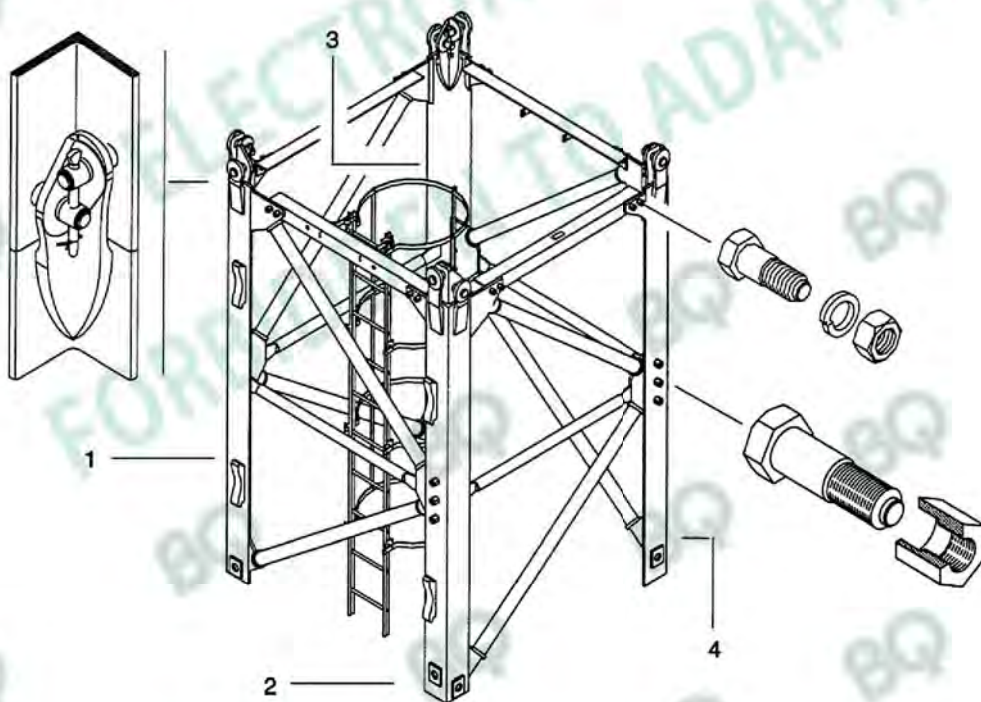


III Preparation for Installation of Mast Section

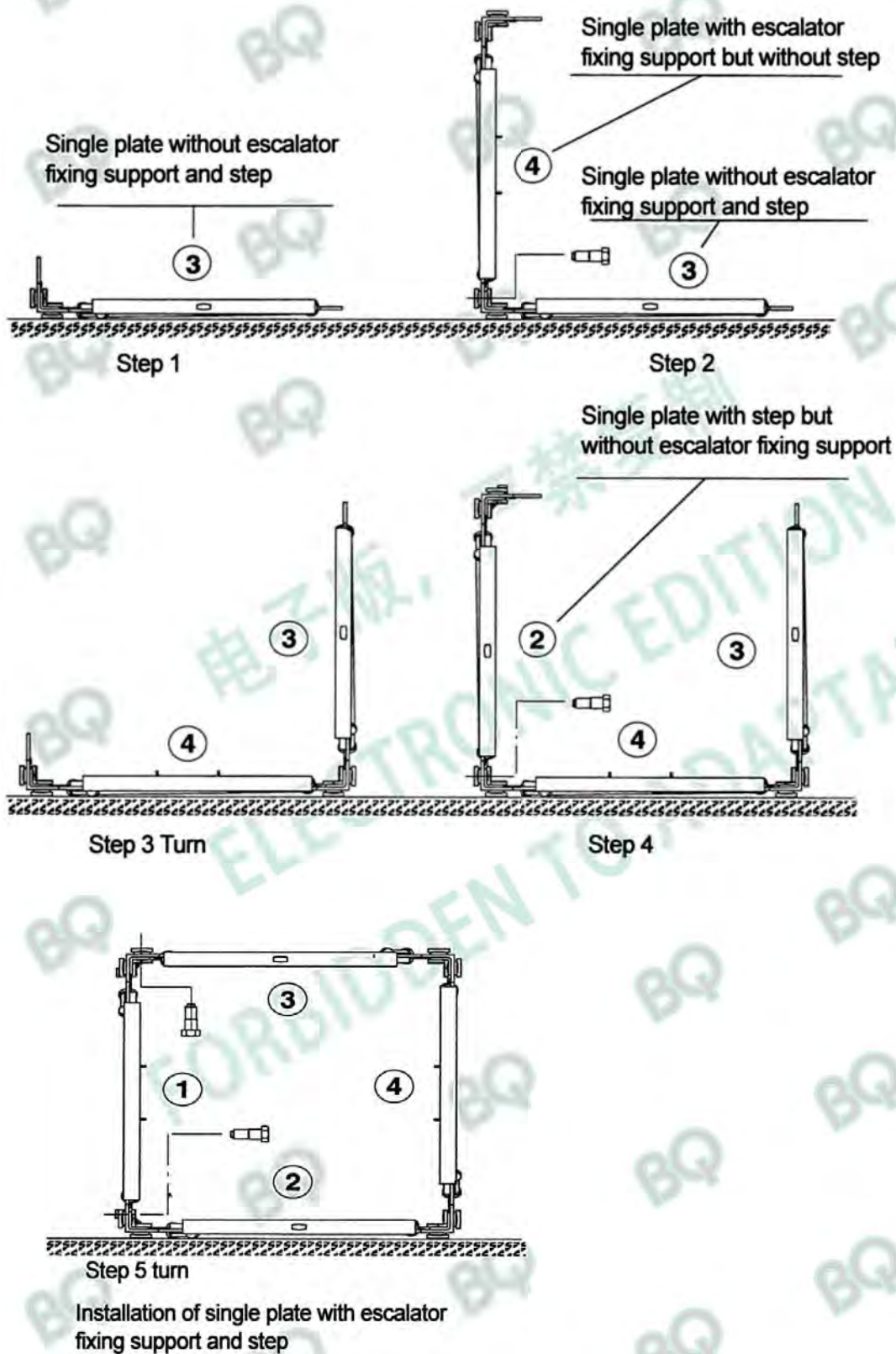
Note: before installation, visually check the steel bar and welding, in case of deformed, twisted or weld-cracked components and parts, return them to re-processing and repair.

1 Assembly of L68B2 Mast Section

- A mast section is composed of 4 plates.
- 2 of the plates (1 and 2) are with jacking steps.
- The other 2 plates (3 and 4) are without jacking steps.
- The two plates with gusset plate to fix escalator shall be placed face-to-face.
- The plates are fixed by with 12 high-strength bolts. The bolt head shall face outward.
- There are 8 shaft pins connecting between each mast section and whole set of channels is provided.



1.1 Assembly and Formation of Mast Section

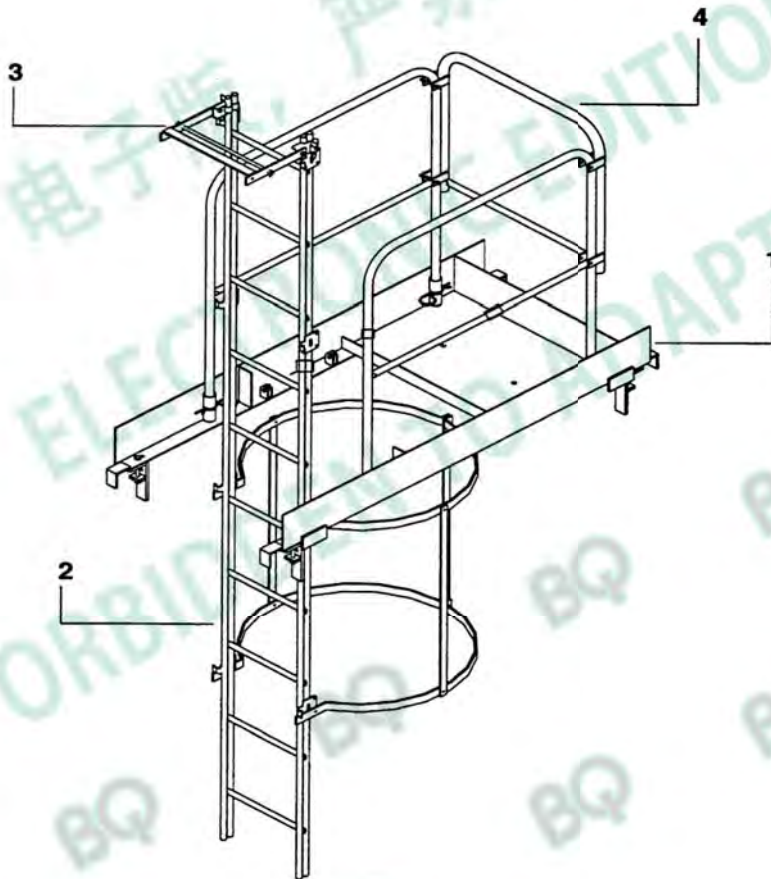


3 Channel

3.1 Rest Channel

The rest channel is composed of:

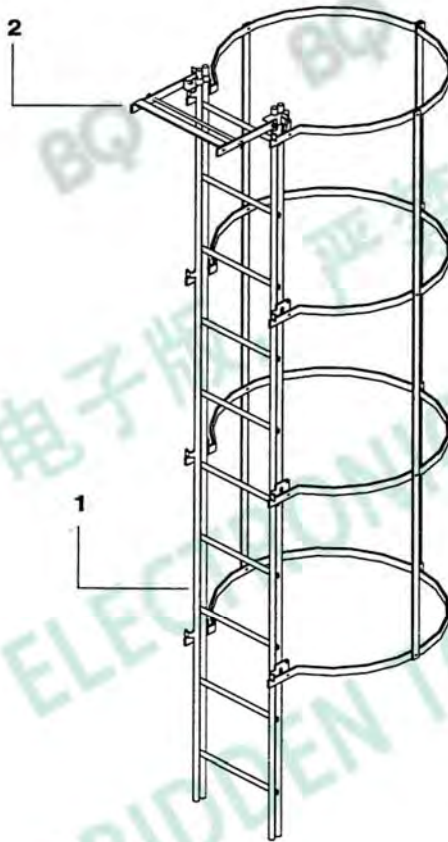
- A platform (1)
- A 3m long escalator (2)
- A escalator arresting device (3)
- 3 guardrails (4)
- Other fasteners



32 Standard Channel

The standard channel is composed of:

- A 3m long escalator (1)
- A escalator arresting device (2)
- Other fasteners

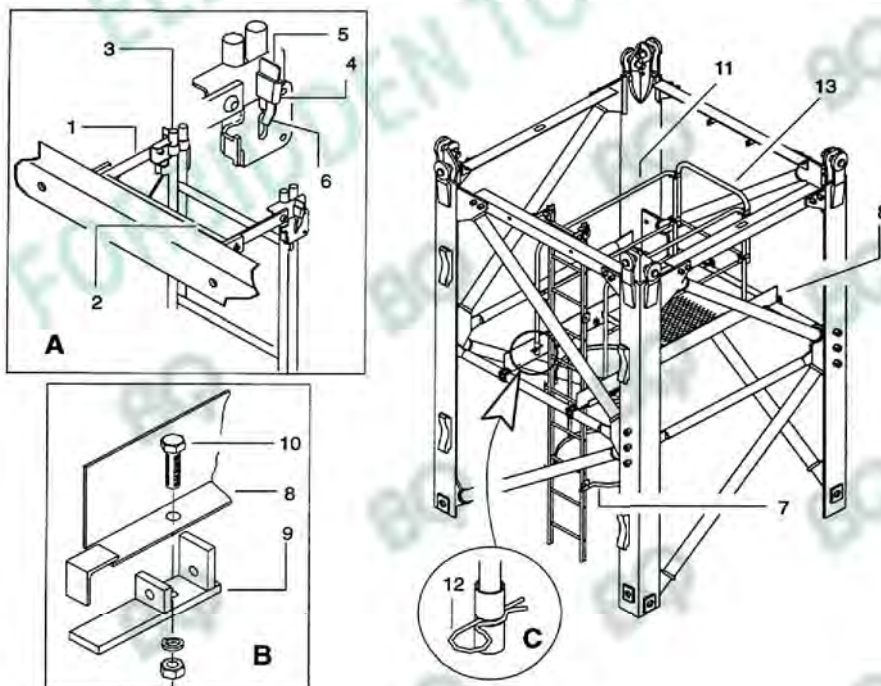


4 Assembly

4.1 Assembly of Rest Channel

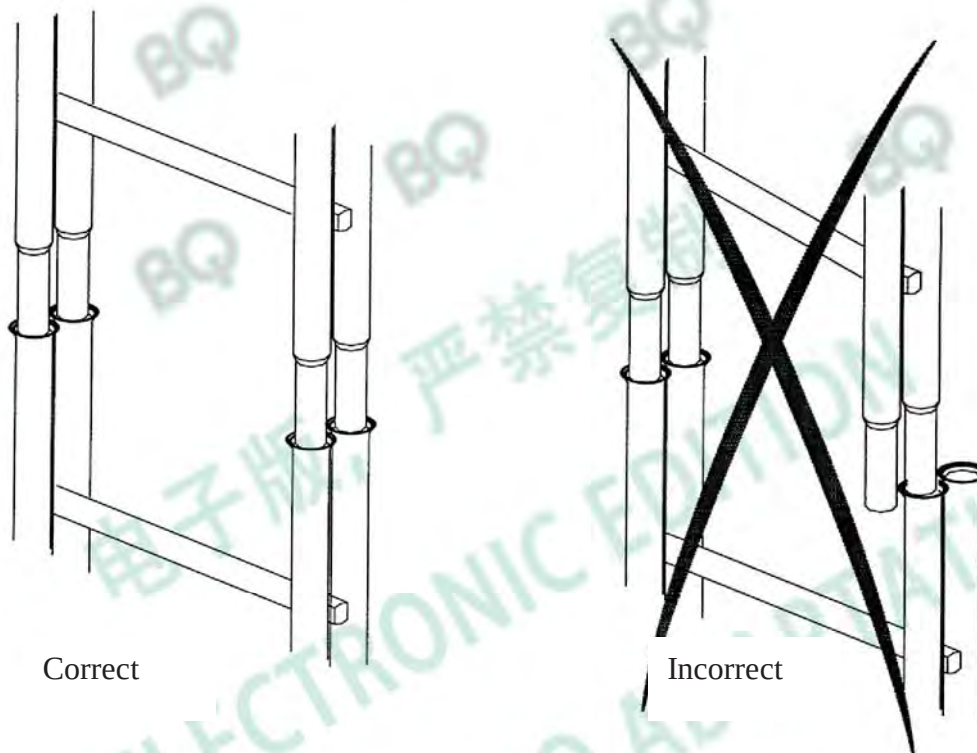
During installation of the channel the 3m mast section shall be vertical.

- Erect the mast section, install escalator (1) onto step side of the mast section, connect it with pin (2) and place cotter pins (Drawing A).
- Check if opening of the escalator is clean and free of foreign substances or deformation.
- Install the escalator with retainer into the mast section. Place the top end of the escalator on the support (1).
- Install locating collar (4), place wedge plate (5) and knock, and then bend over lug plate (6). Open retainer (7).
- Install rest platform (8) (at opening side of the escalator), and use base plate (9) and bolt (10) to fix it. (Drawing B)
- Install guardrail (11) and use cotter pin (12) to fix it and then install another guardrail (13), lock it with a cotter pin. To avoid shaking of the escalator in the mast section during installation, use an iron wire to tighten it.



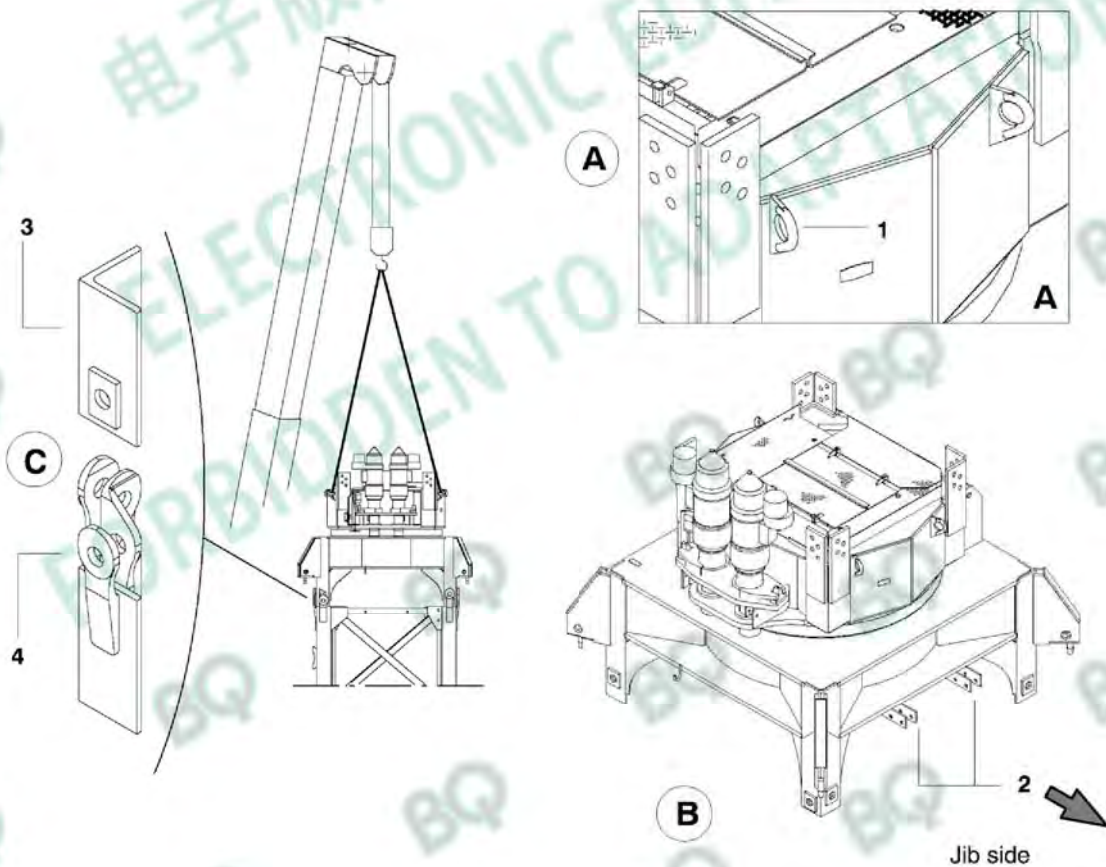
Note:

- For safety's sake, pay attention to correct installation of each escalator as per in drawing below when install mast sections.



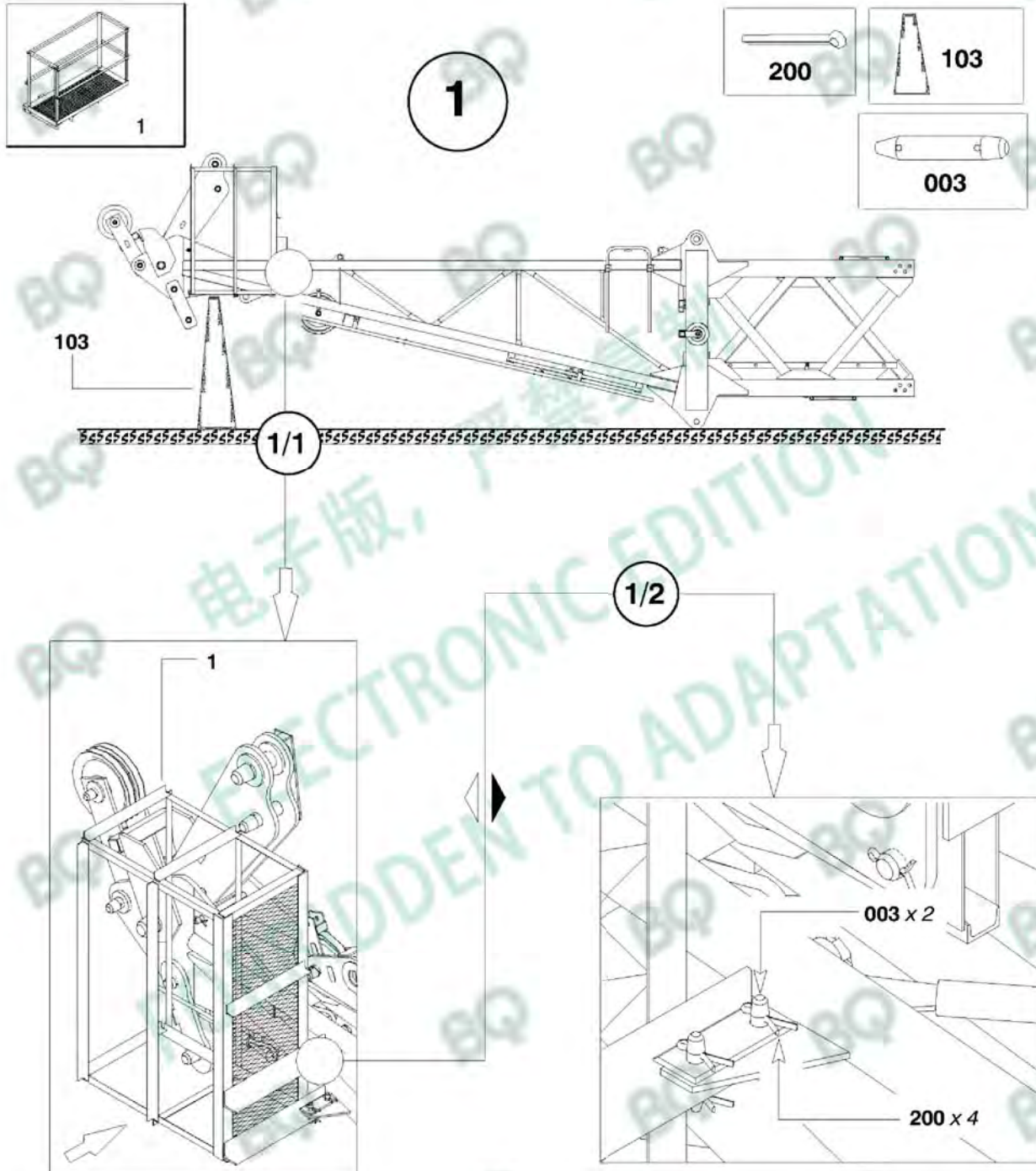
IV Installation of Slewing Mechanism

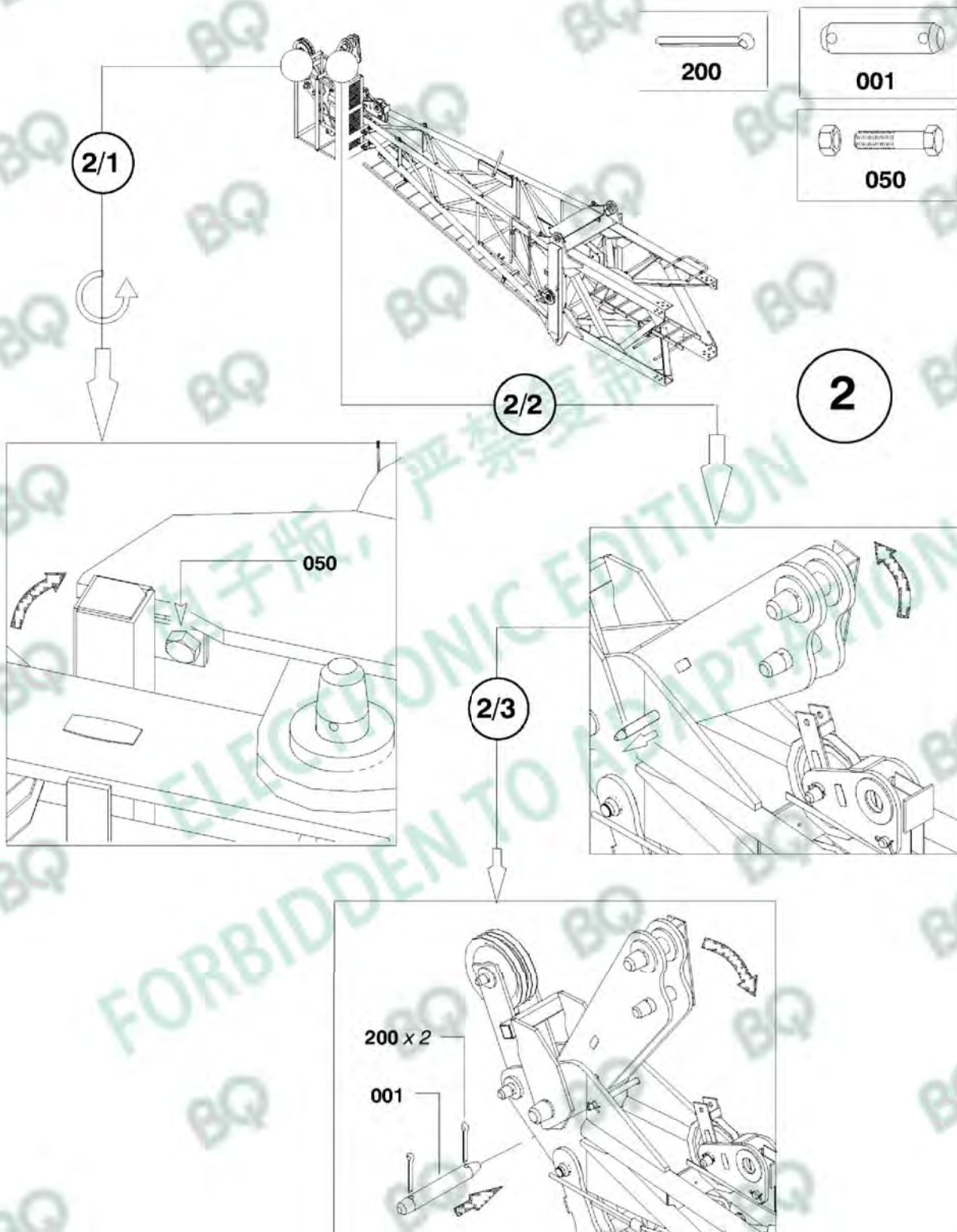
- Clean connecting surface and connecting hole of the lower support leg which shall be free of oil or burr.
- Use lifting lug (1) to hoist the slewing mechanism. lifting ear are located on the front and back of slewing. Hoist the unit from the ground and then turn monorail supporting plate (2) of the lower support toward opposite side of the mast jacking step. In case of no jacking step on the mast, then determine the installation direction according to direction of the jib.
- Hoist, till it is possible to insert leg (3) of the support into fishplate (4) of the mast (Drawing C).

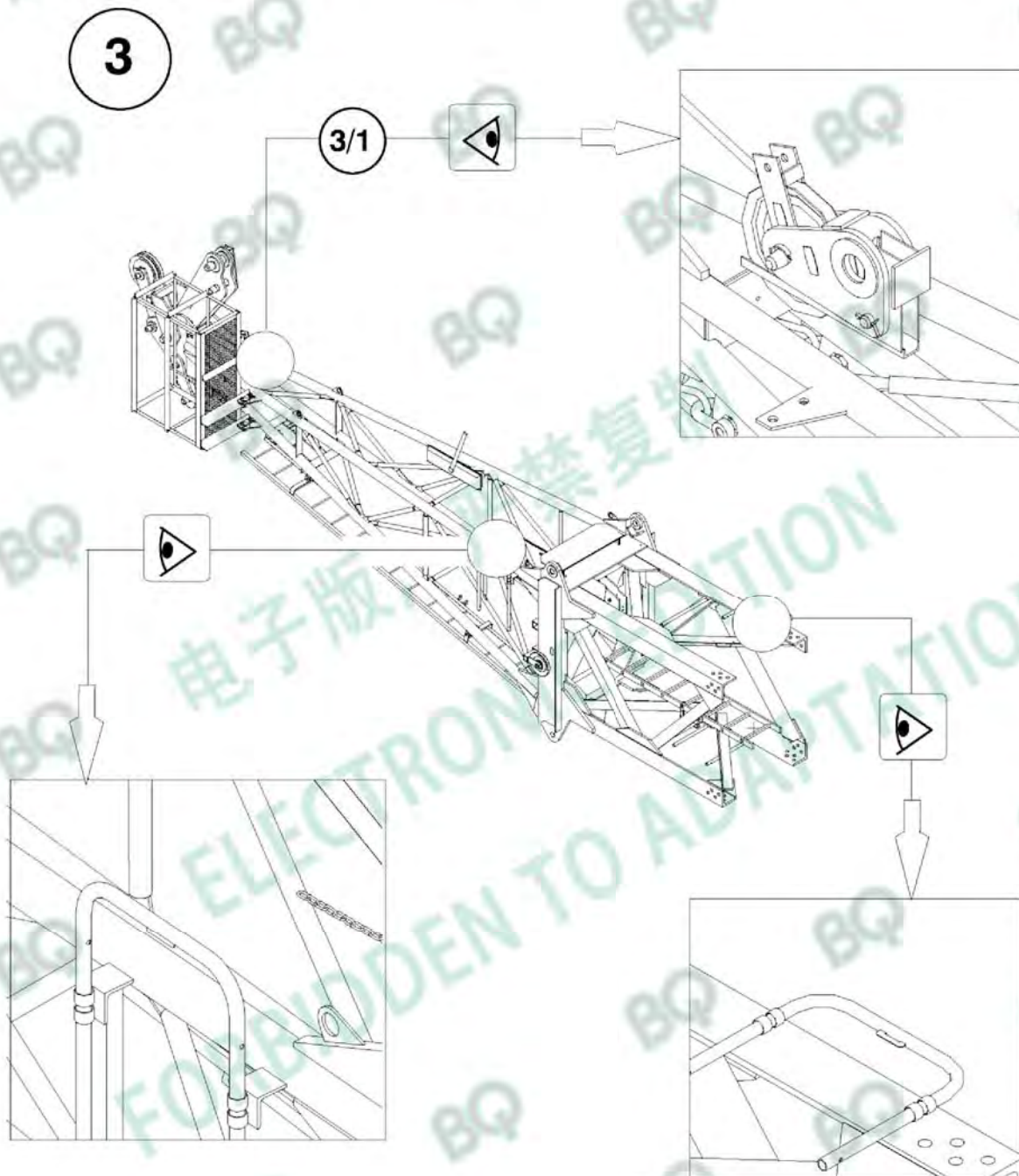


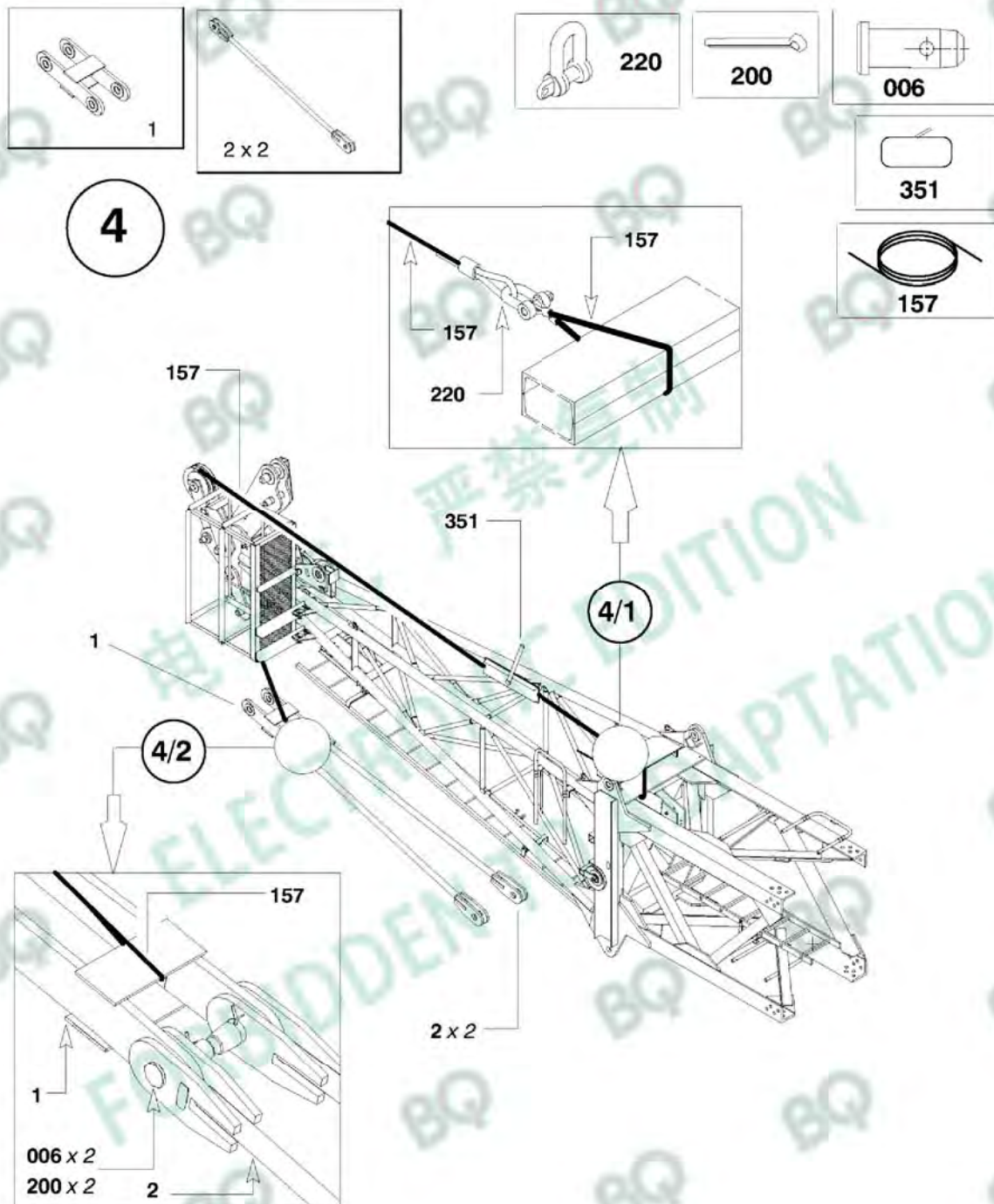
V Installation of Tower Cap

1 Preparation of Tower Cap

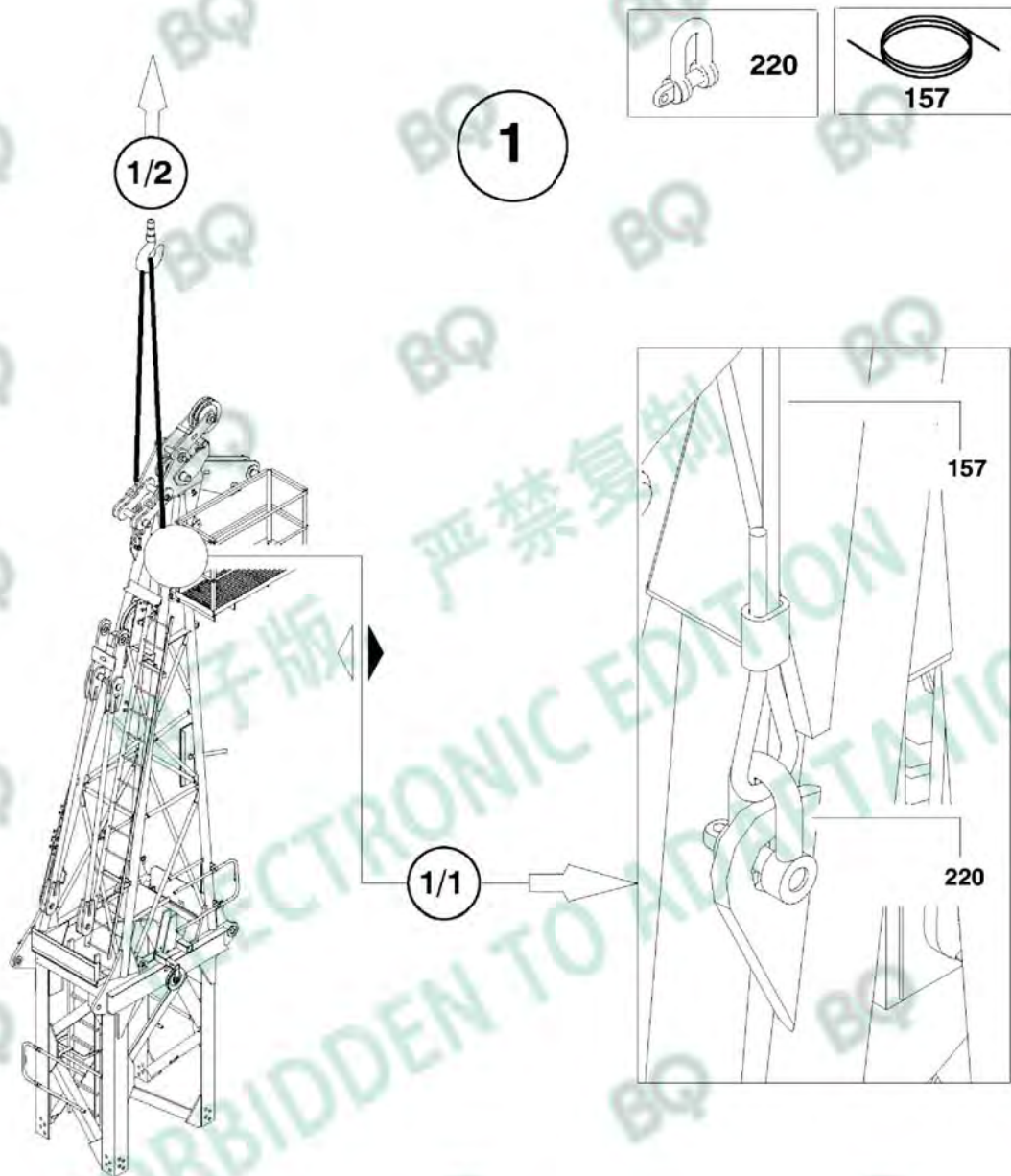




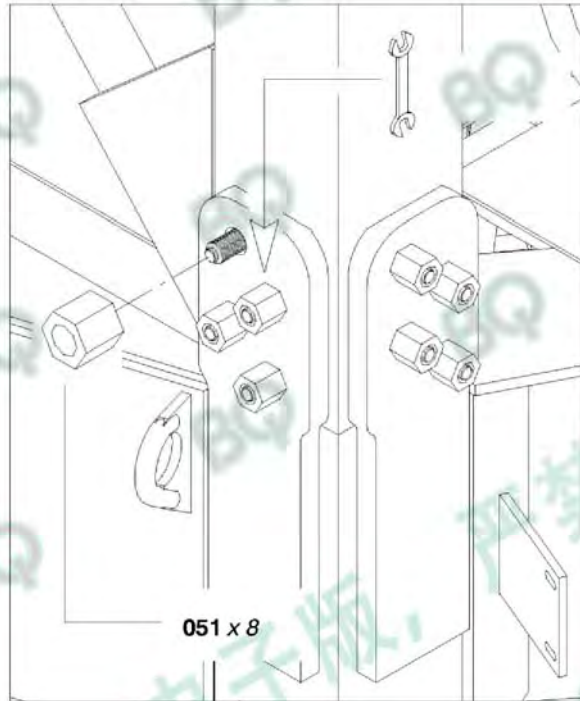




2 Installation of Tower Cap

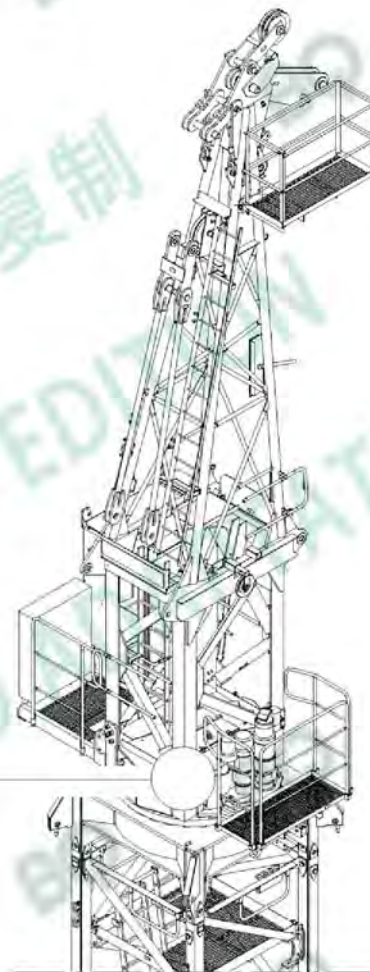






051

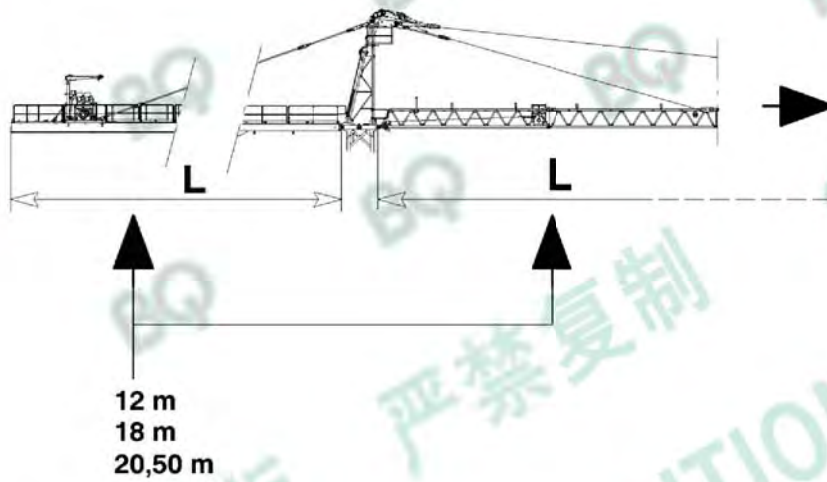
3



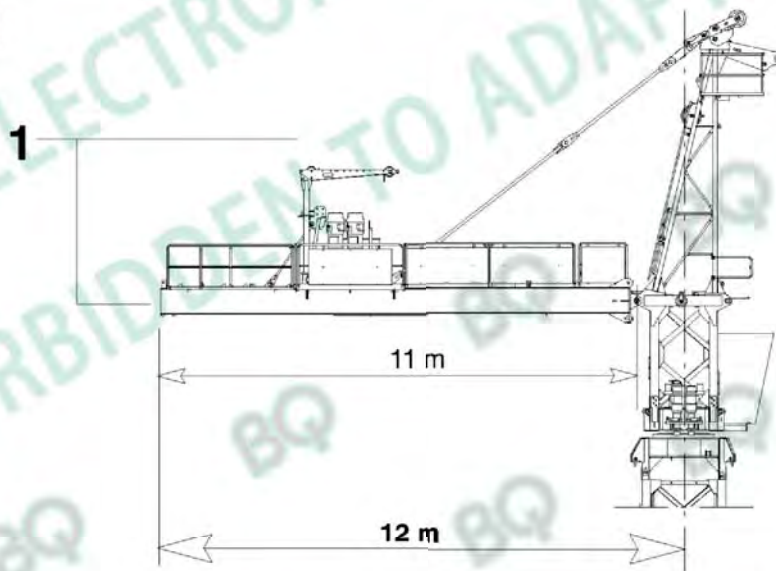
3/1 (x4)

VI Assembly of Balance Arm

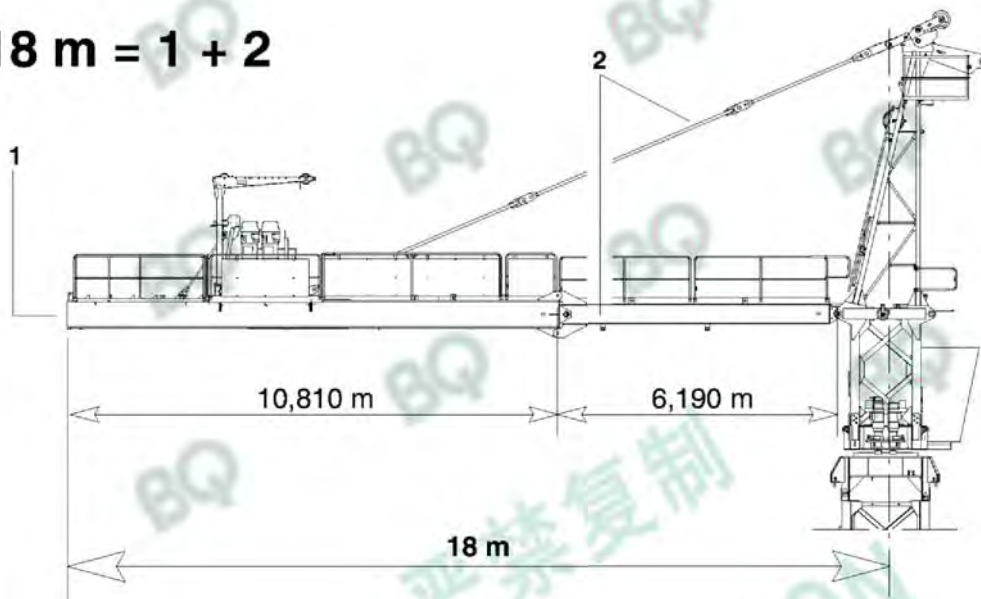
1 Identification of Balance Arm



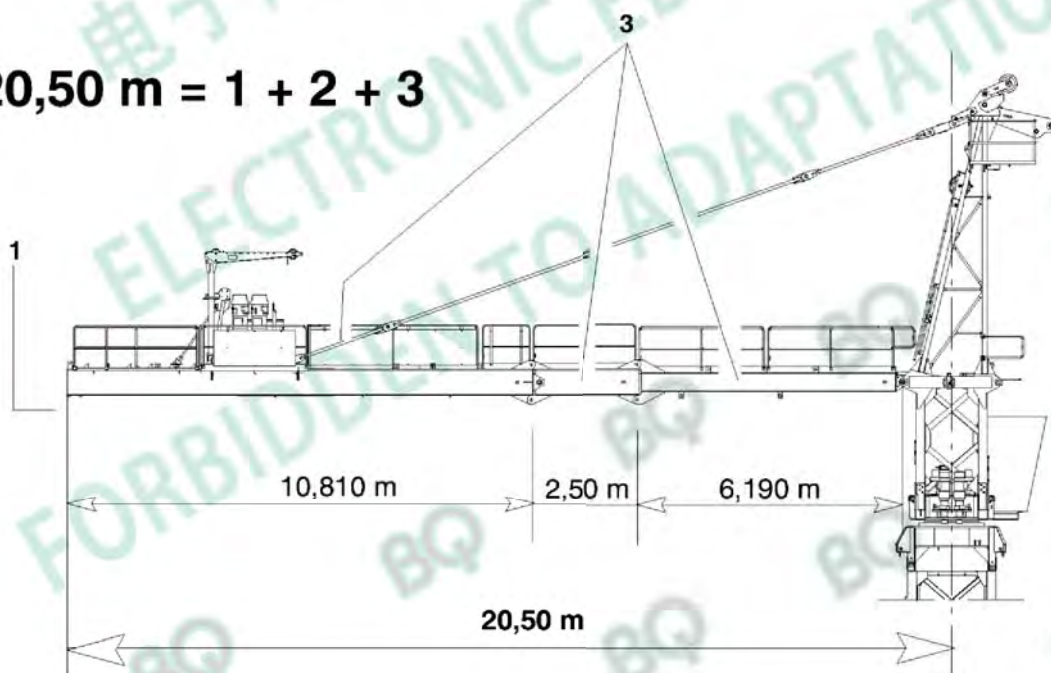
12 m = 1



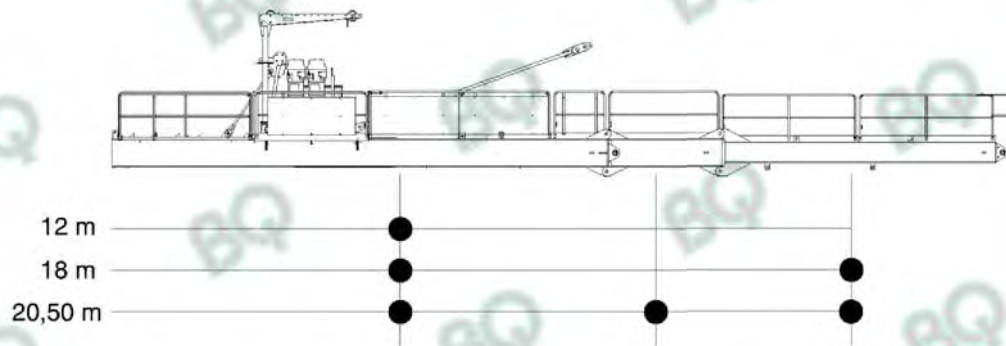
$$18 \text{ m} = 1 + 2$$



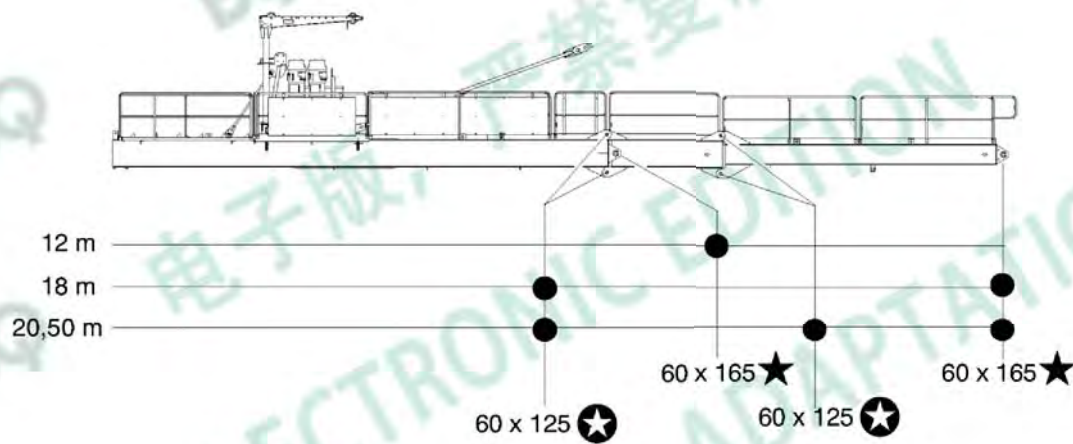
$$20,50 \text{ m} = 1 + 2 + 3$$



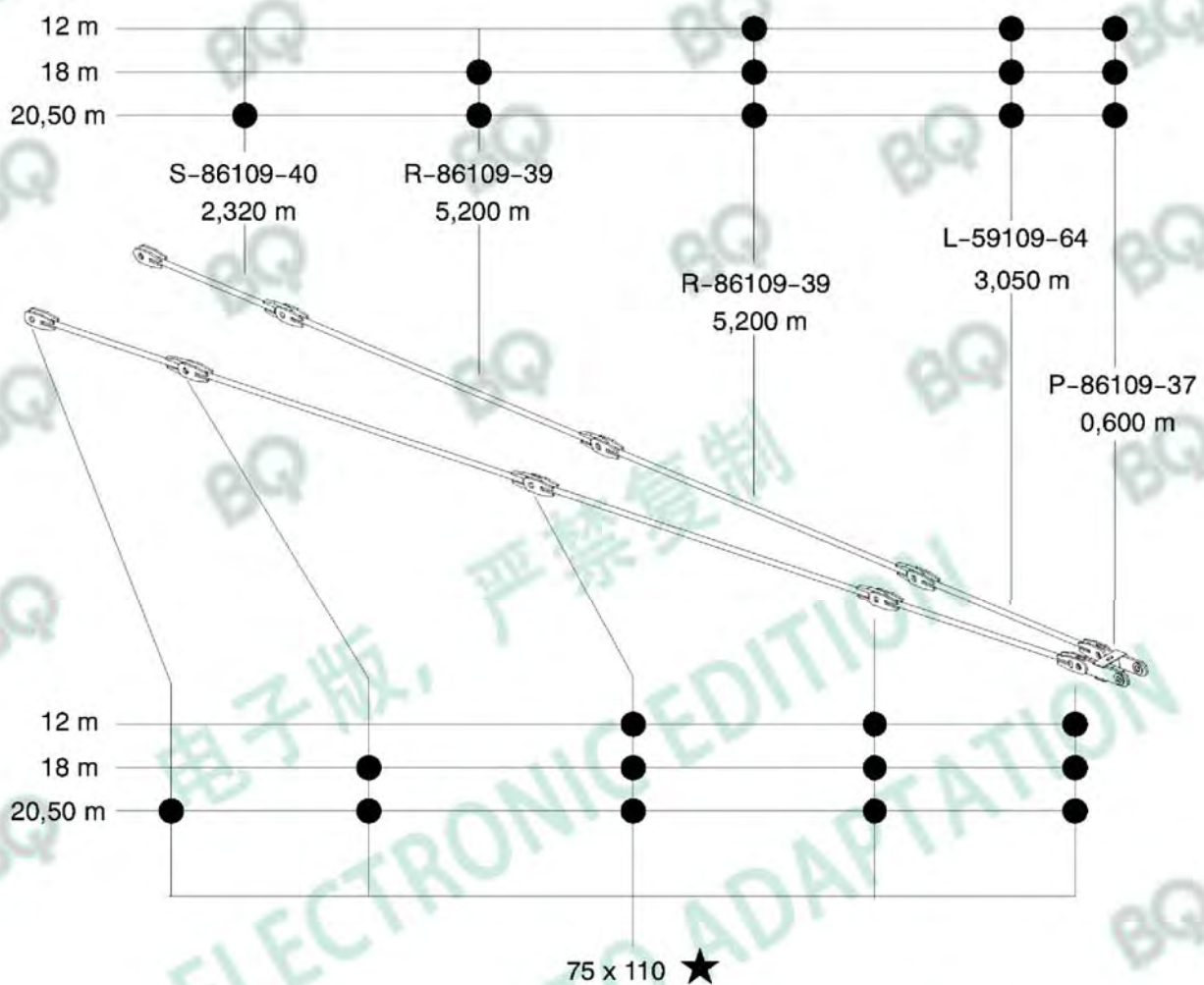
2 Composition of Balance Arm



3 Dimension of Shaft Pin



4 Composition of Pull Rod

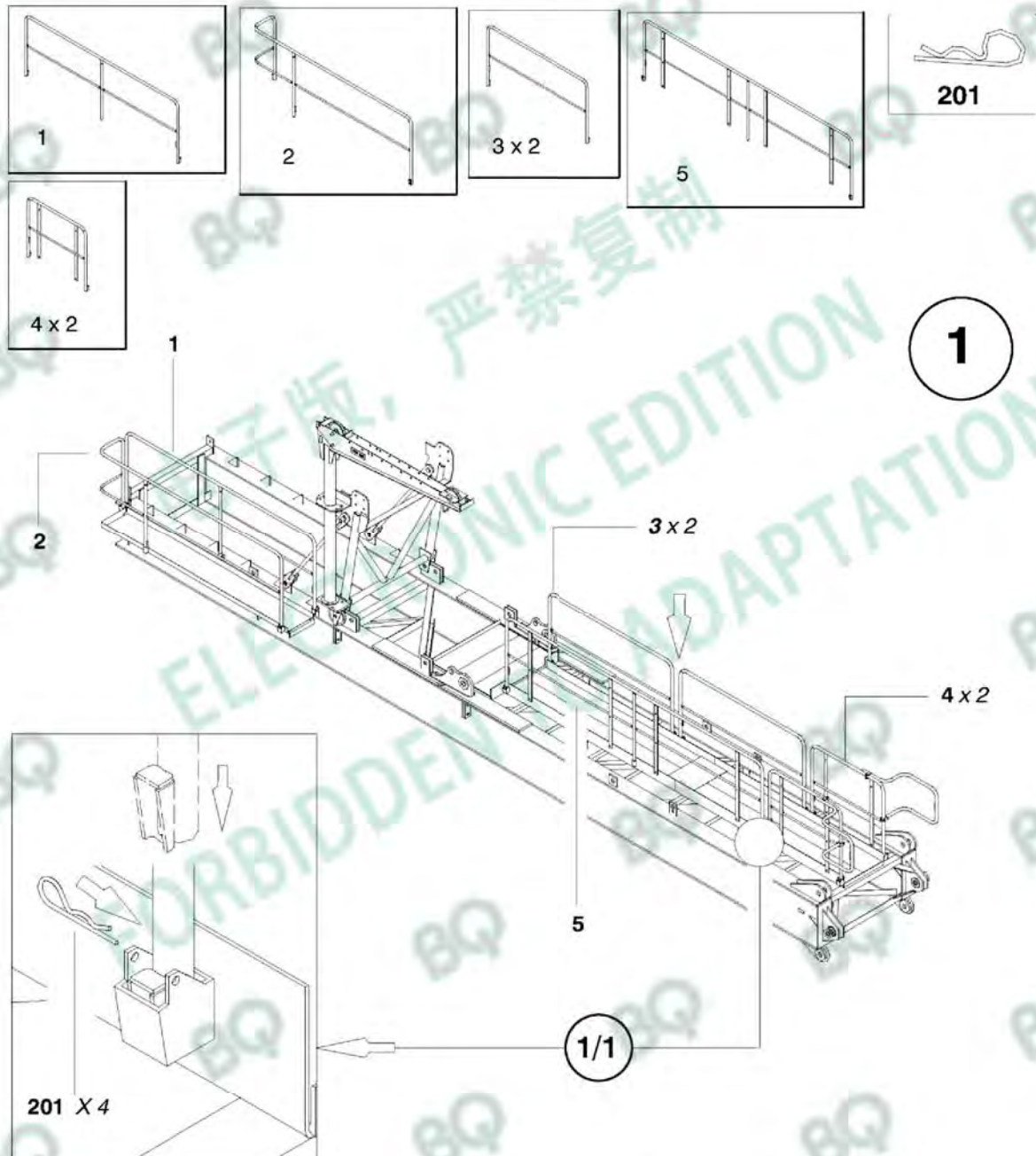


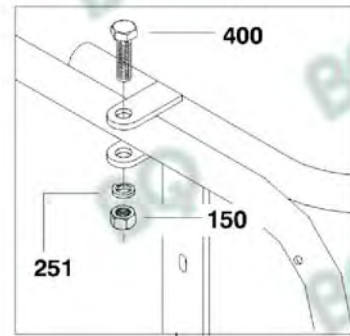
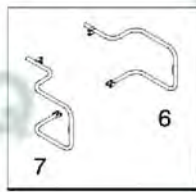
5 Preparation of Balance Arm

Note: wind shields shall be installed onto the balance arm according to the jib length.

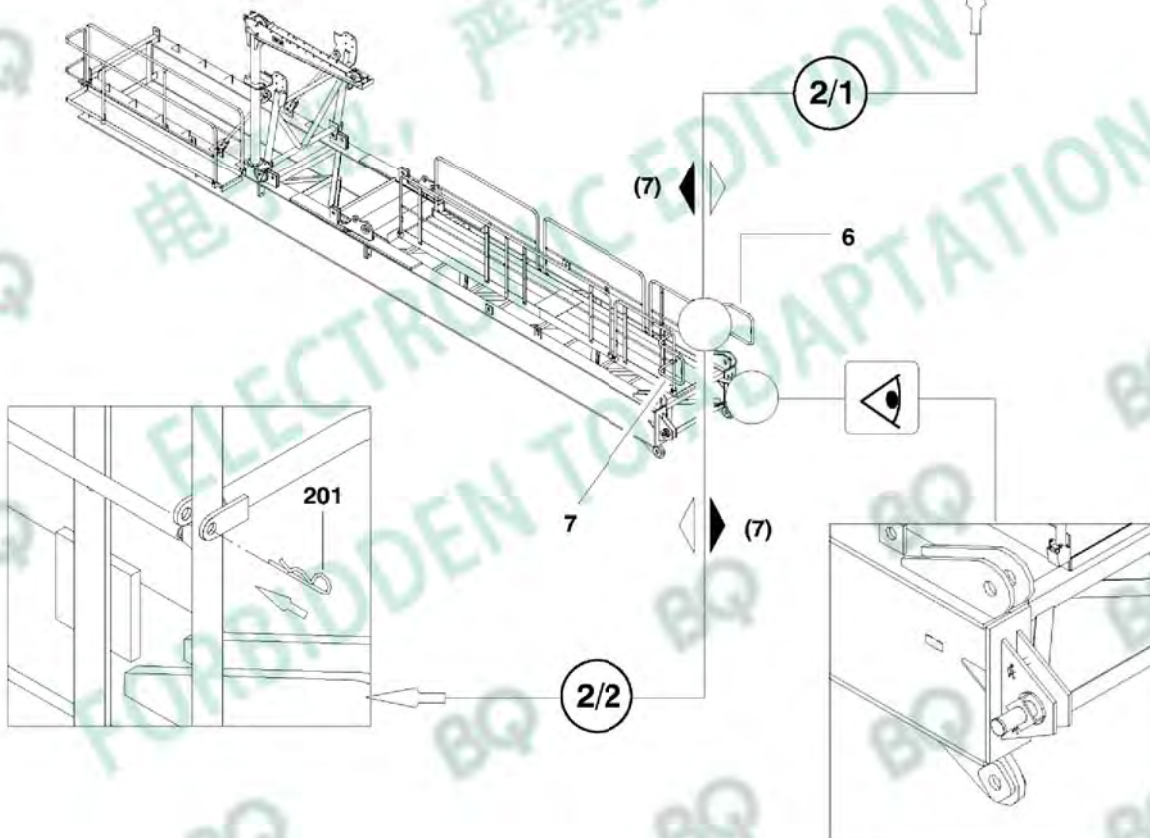
When necessary, check if wind shields are installed.

5.1 12m Balance Arm

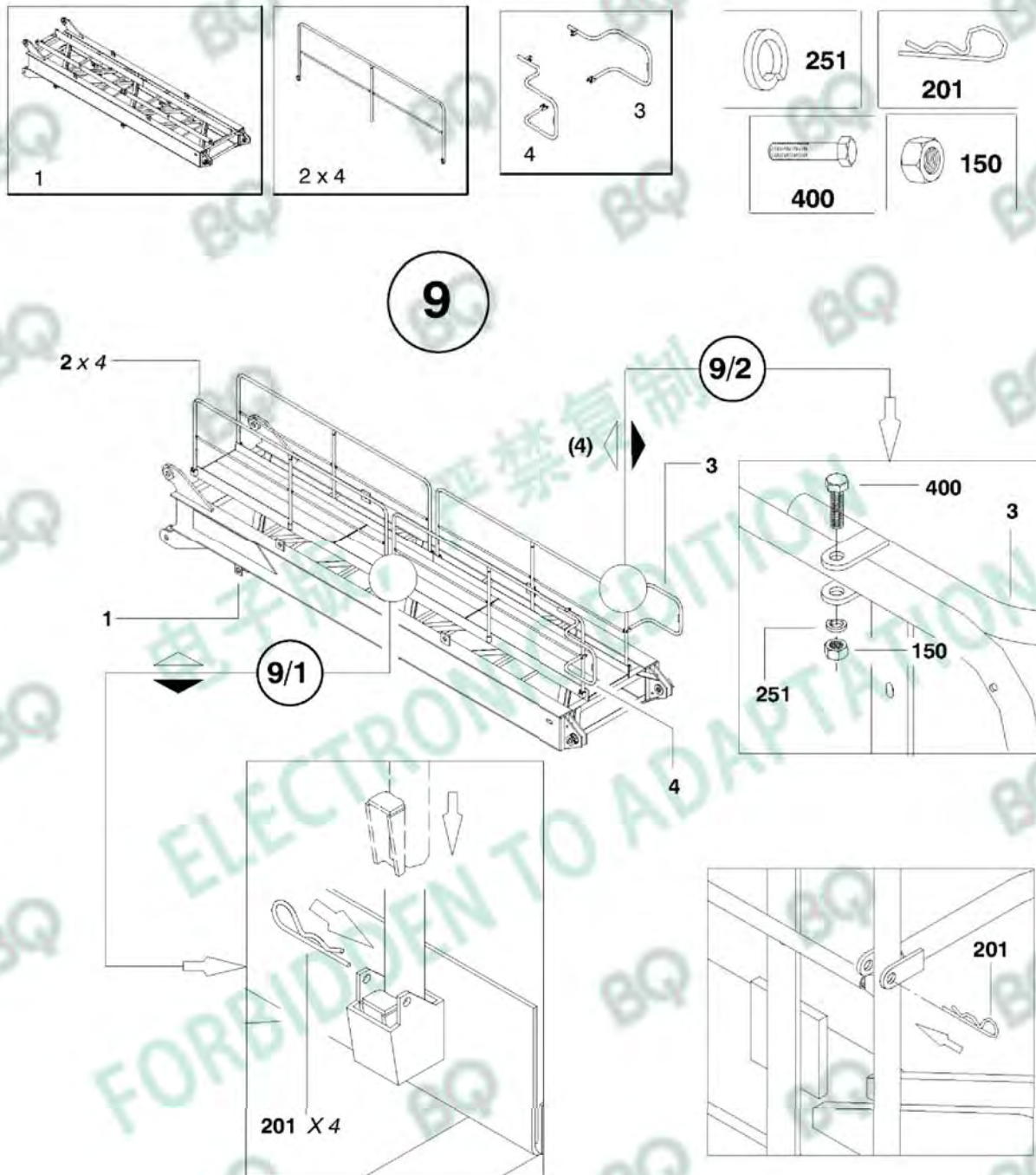


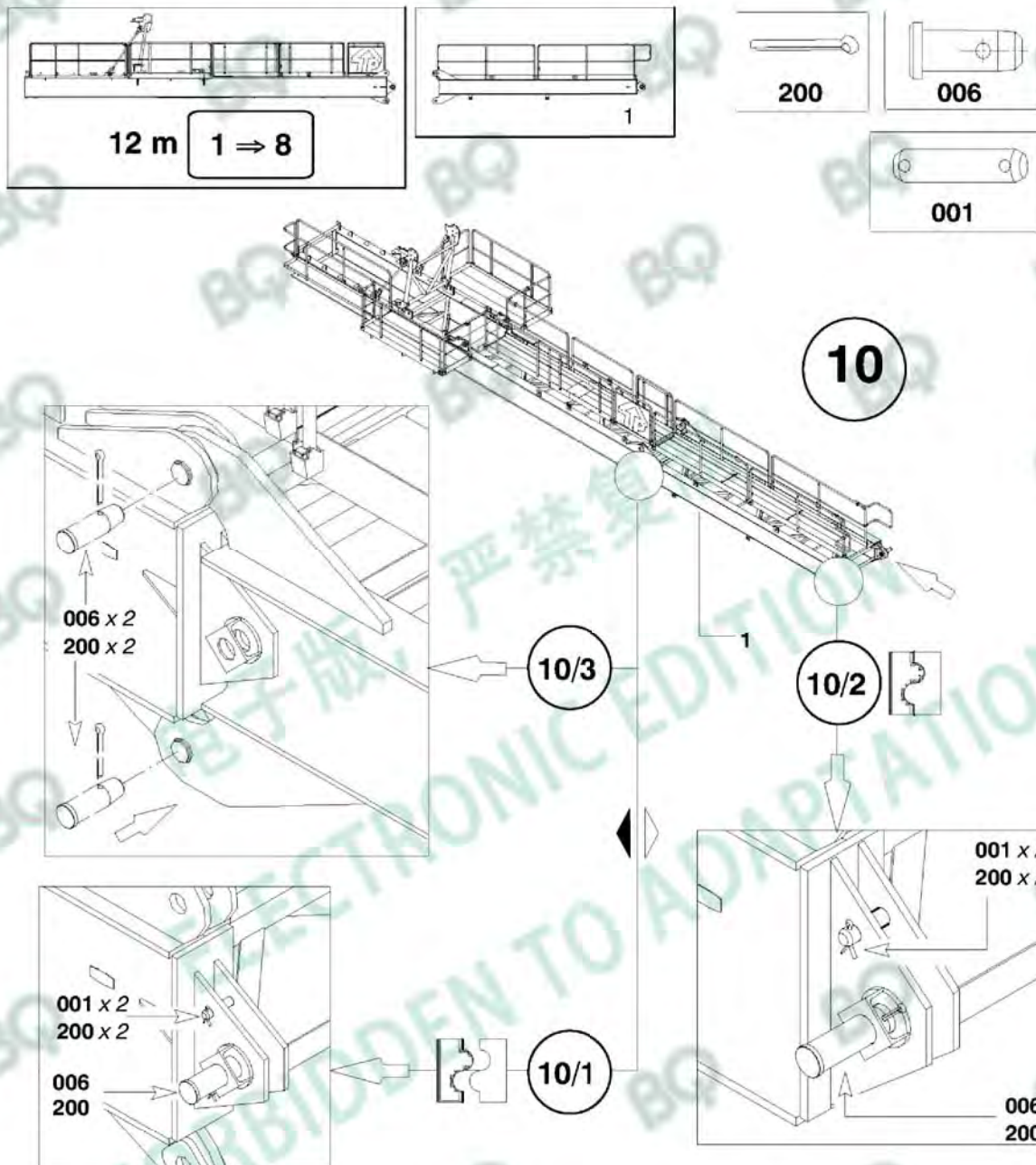


2

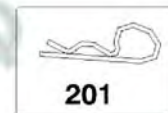
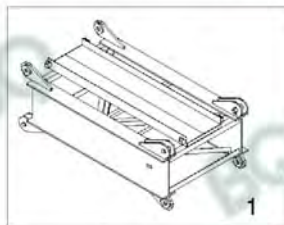


5.2 18m Balance Arm (1+2)



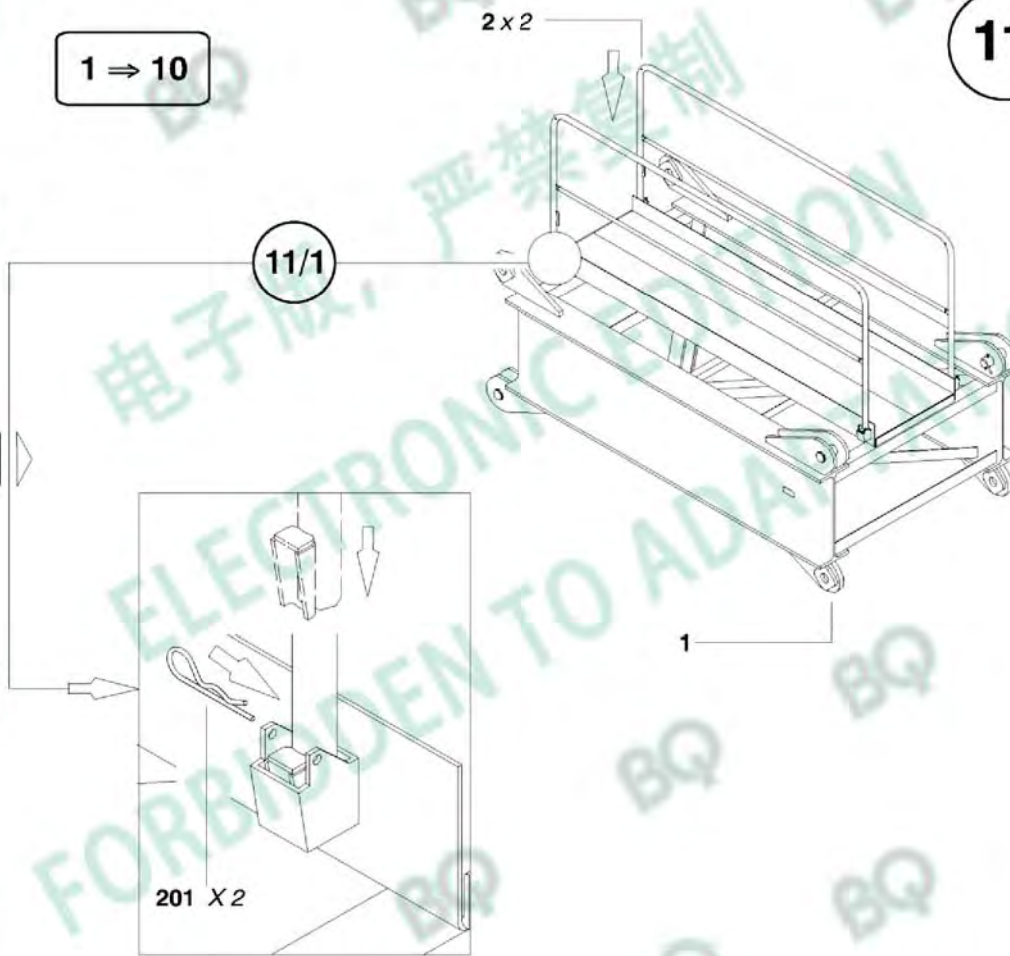


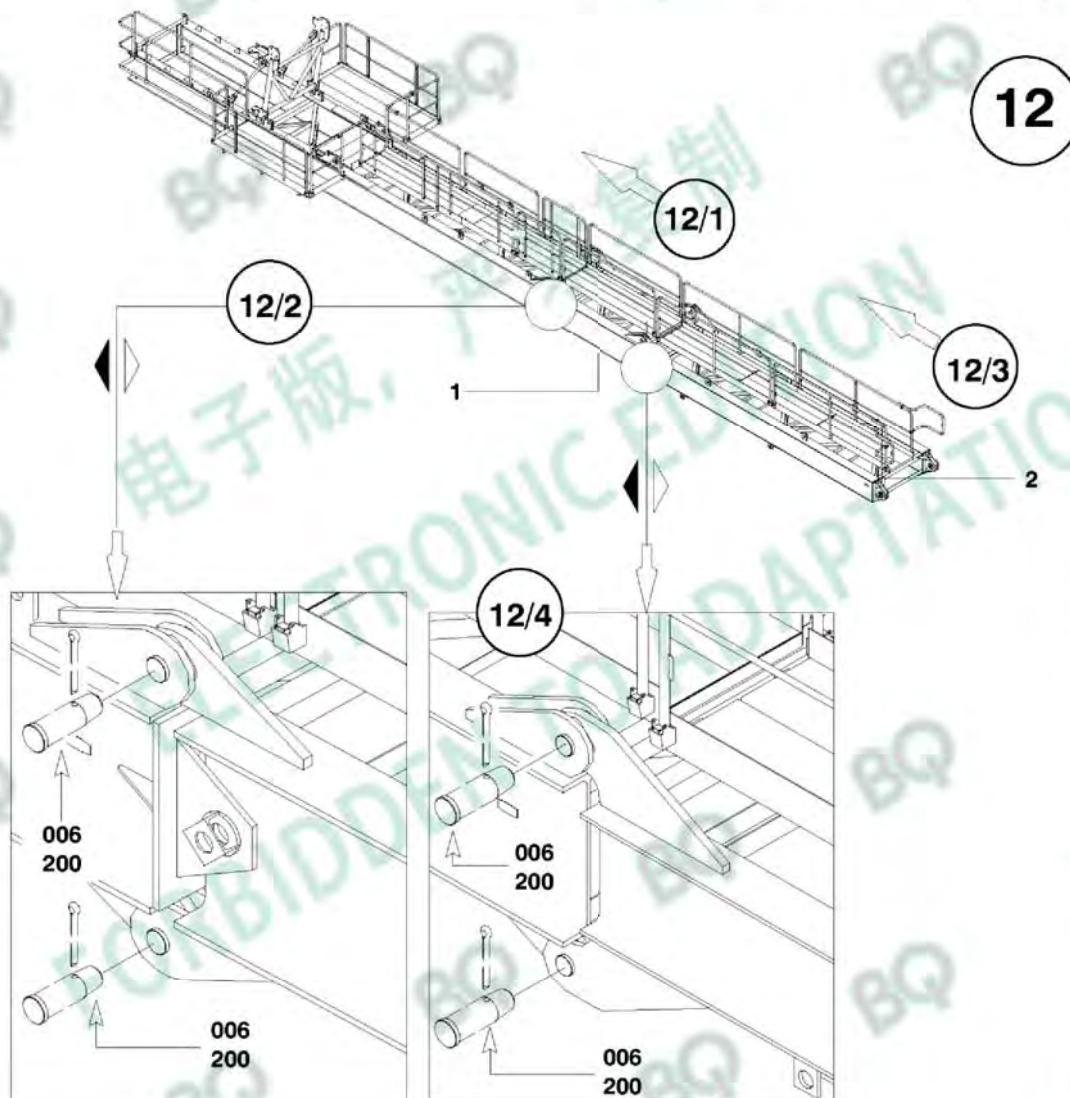
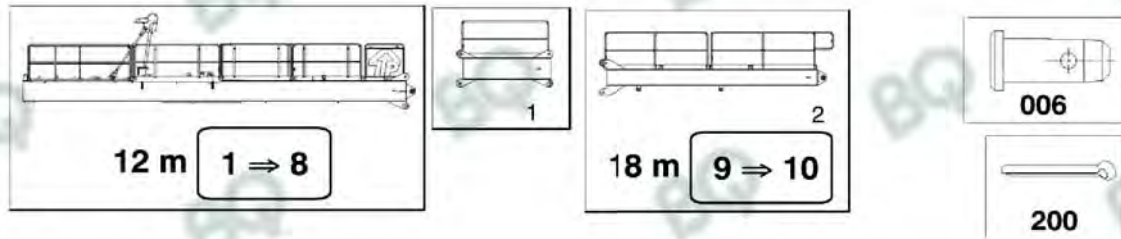
5.3 20.5m Balance Arm (1+2+3)



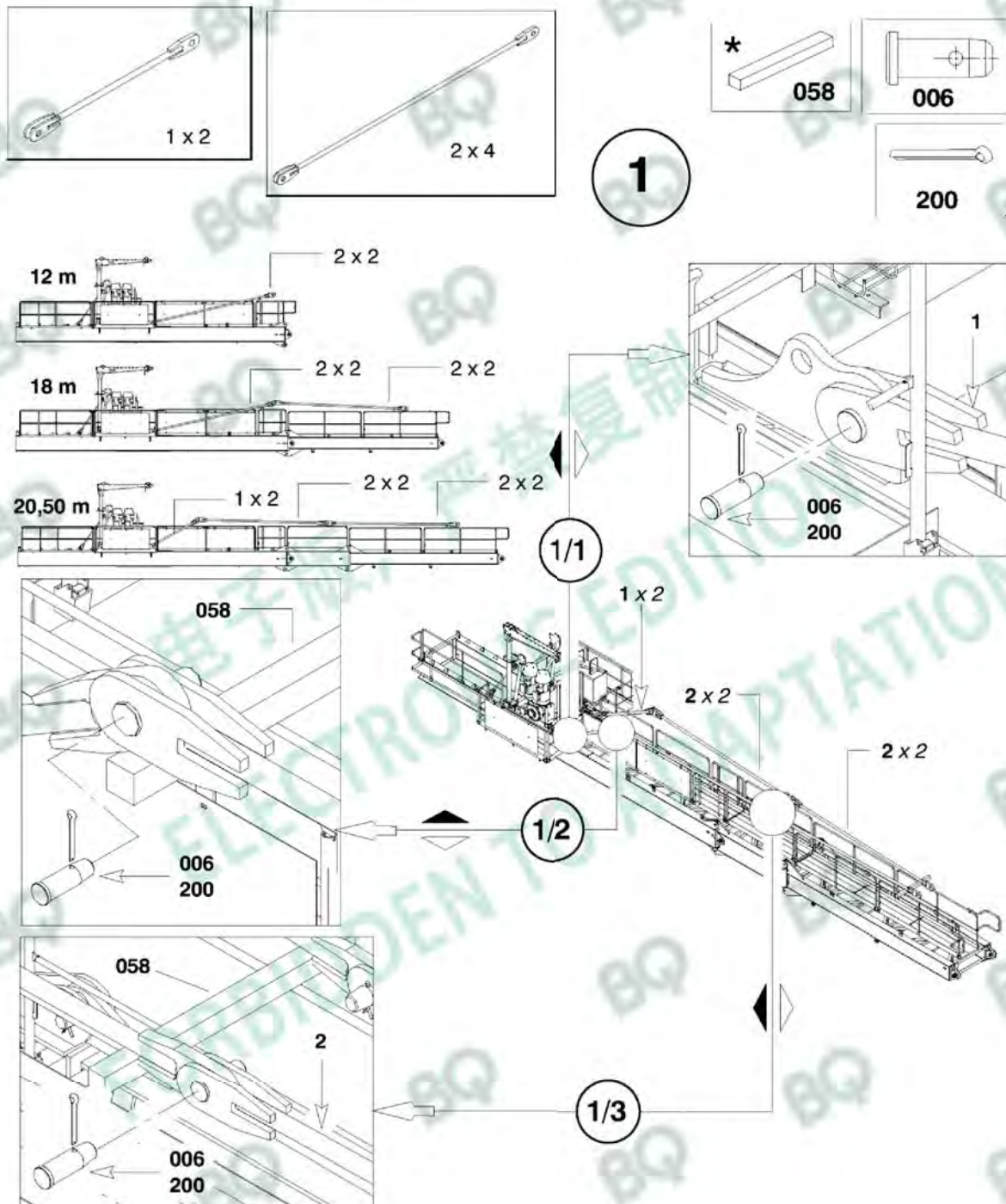
1 ⇒ 10

11





5.4 Preparation of Pull Rod

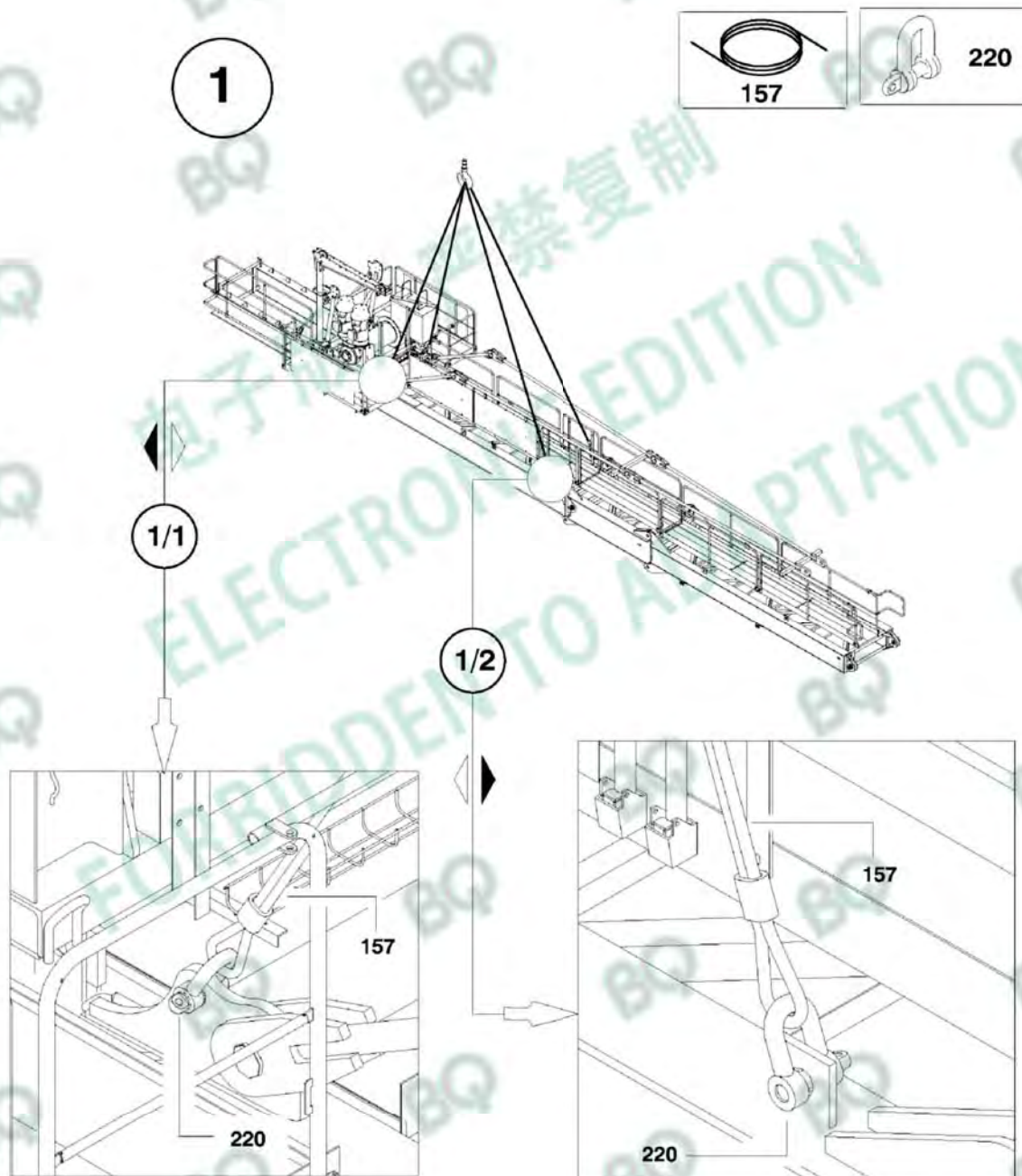


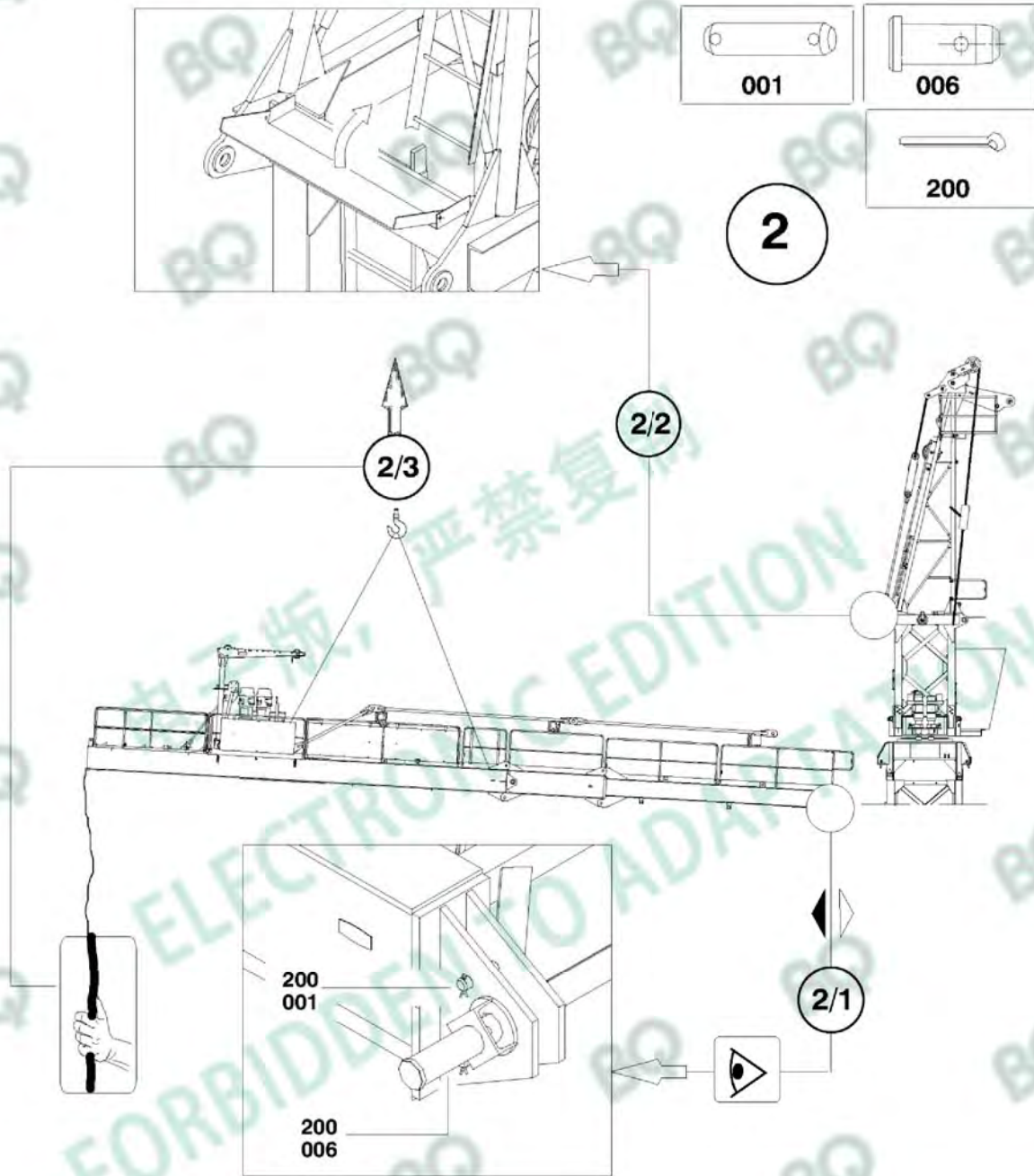
6 Installation of Balance Arm

Safety belt, which is fixed on the tower cap, must be used for operation at root of the balance arm.

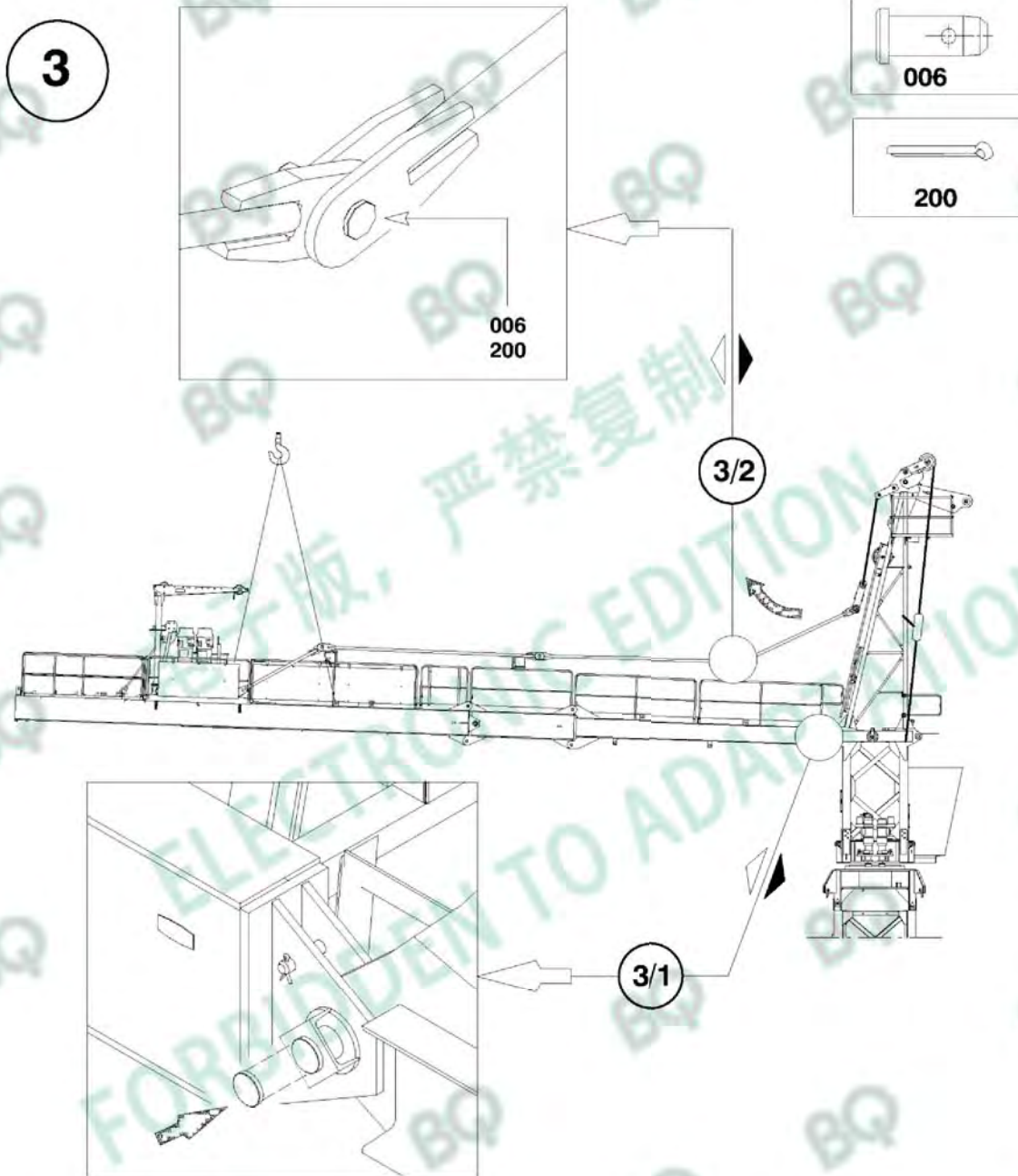
When connecting with pins, slow down the moving speed to avoid swing.

5 Hoist of Balance Arm

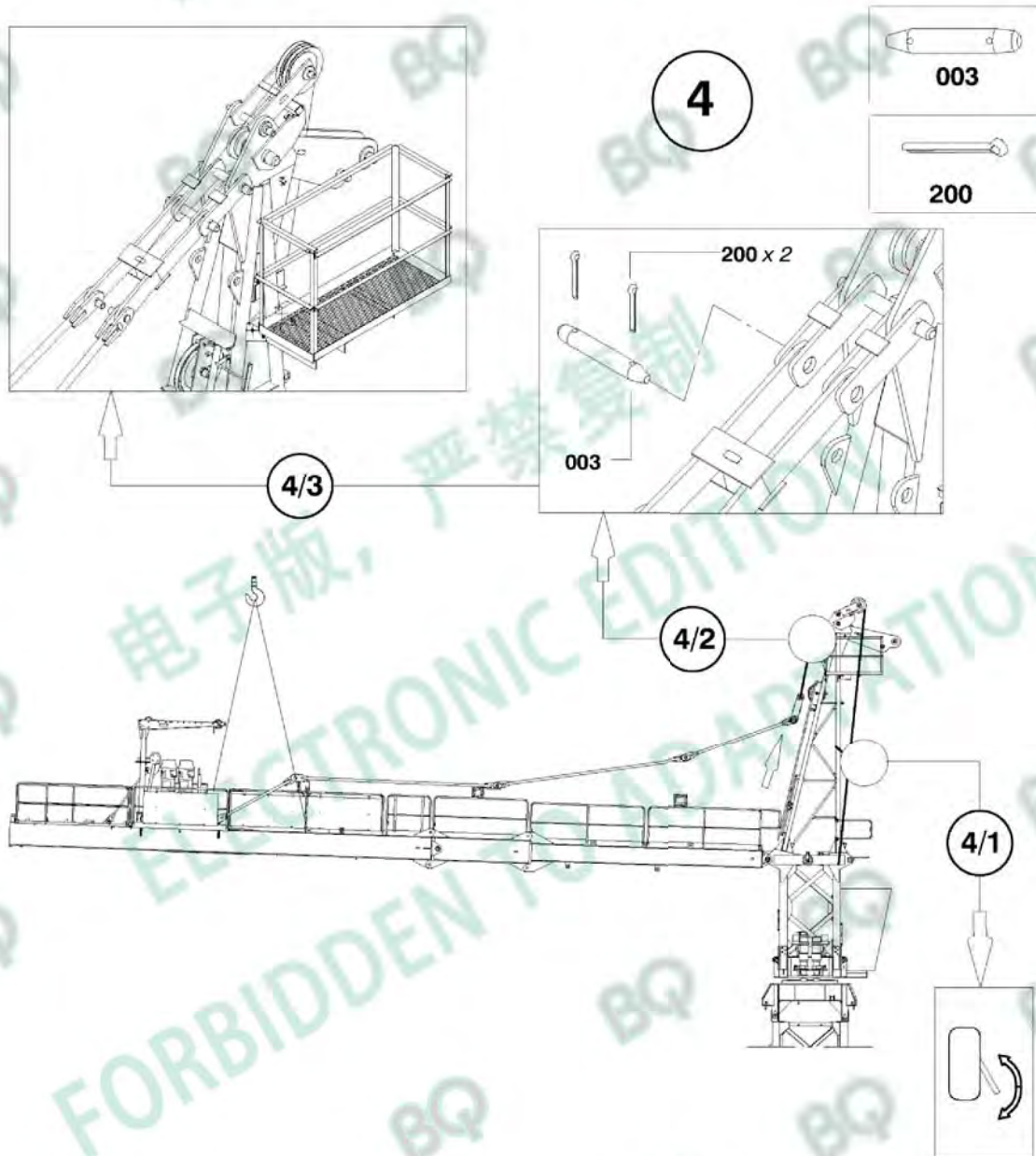




6.1 Fixing the Balance Arm with Pins



6.2 Fixing the Pull Rod with Pins



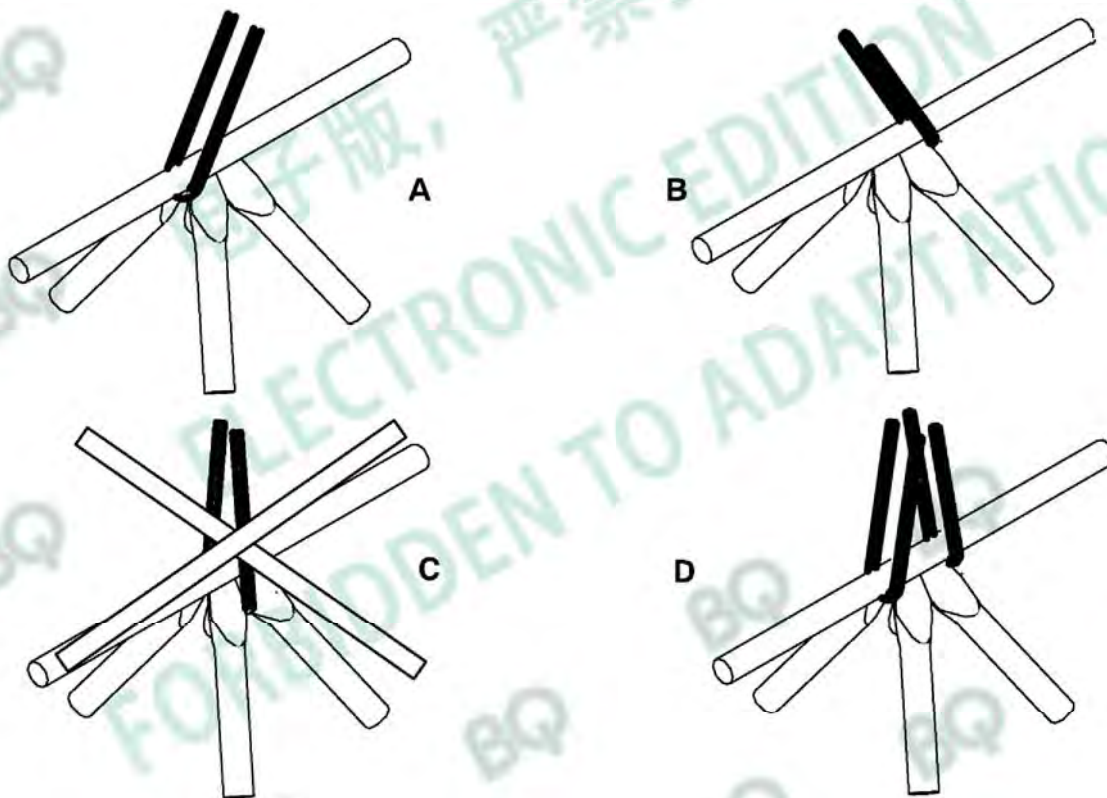
Note: partial ballasts must be provided for jibs of some lengths.

VII Jib Installation

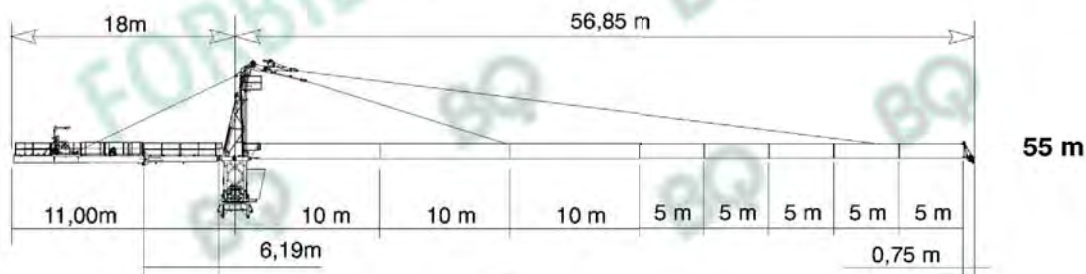
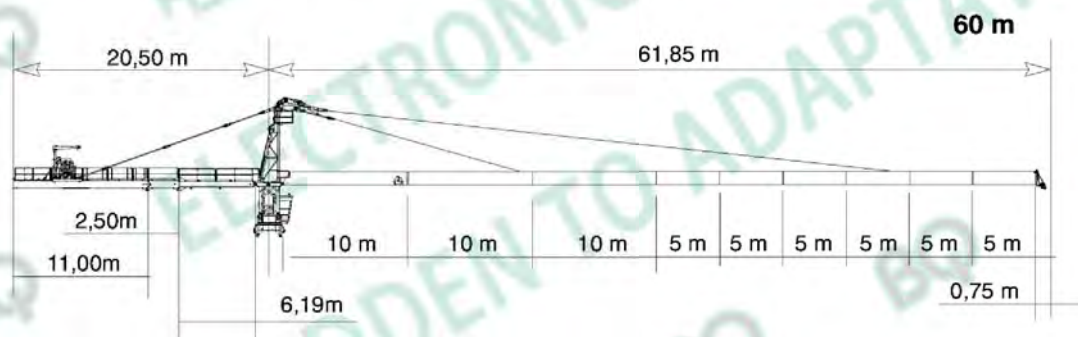
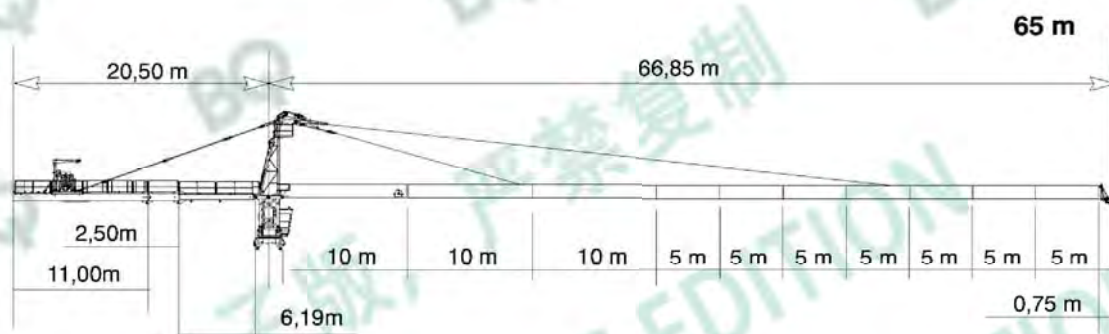
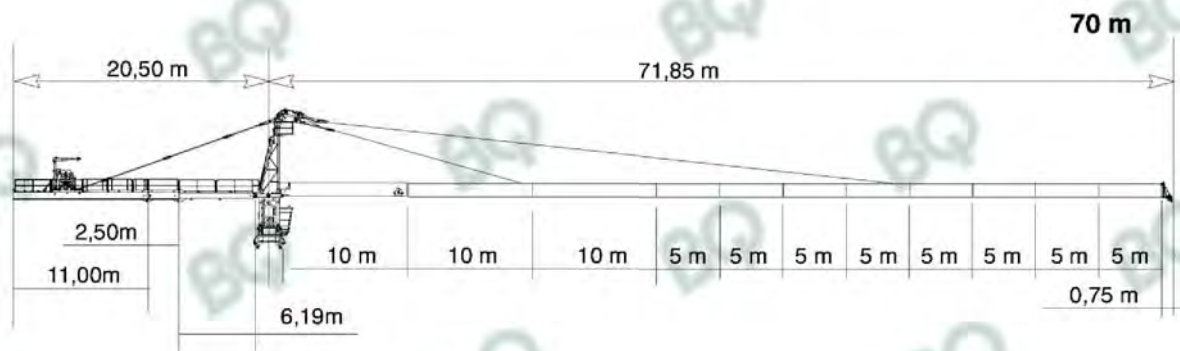
Hoisting

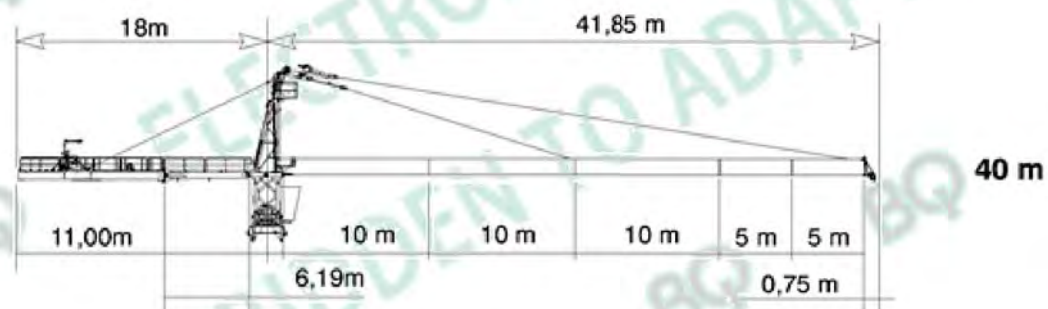
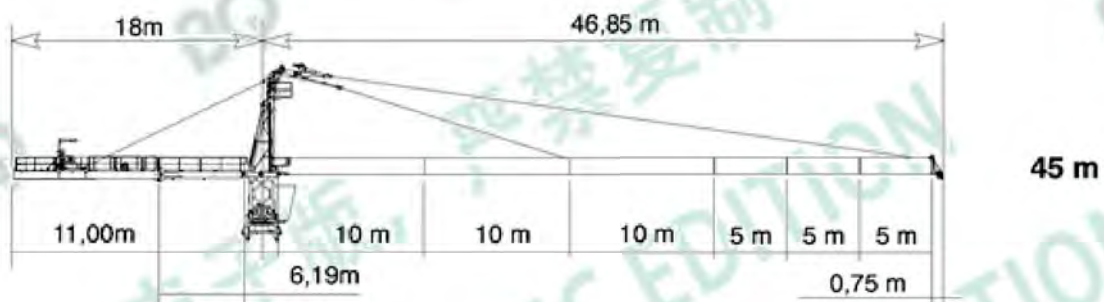
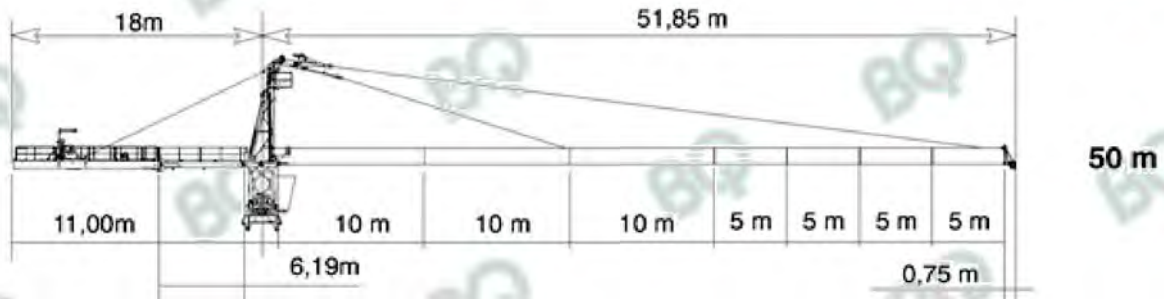
Special note:

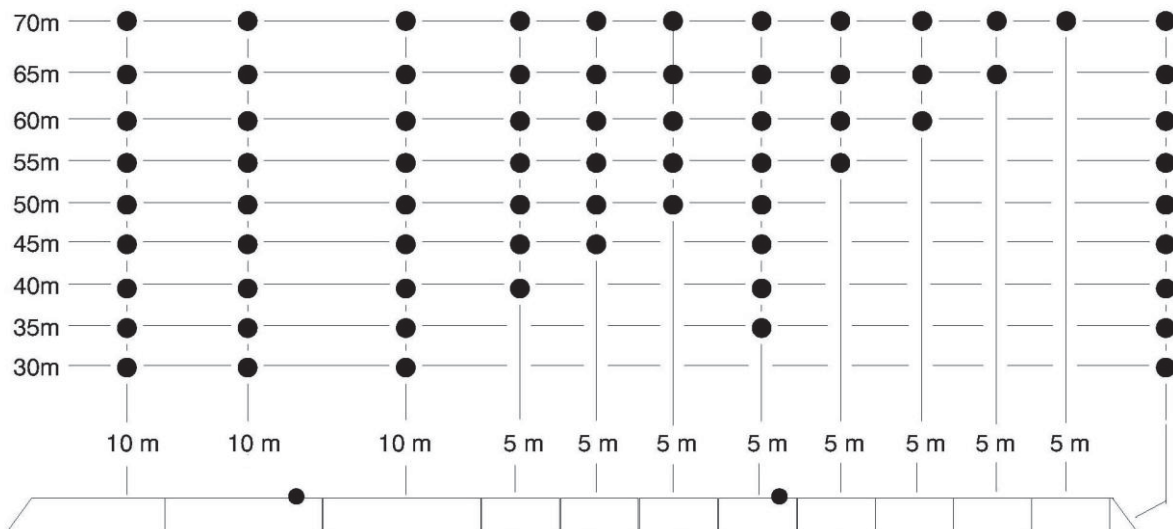
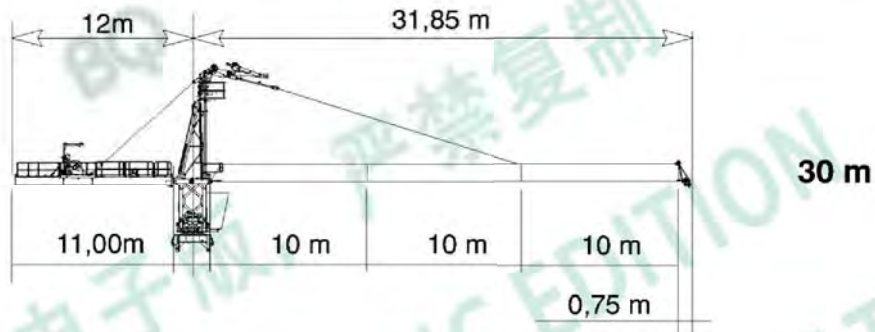
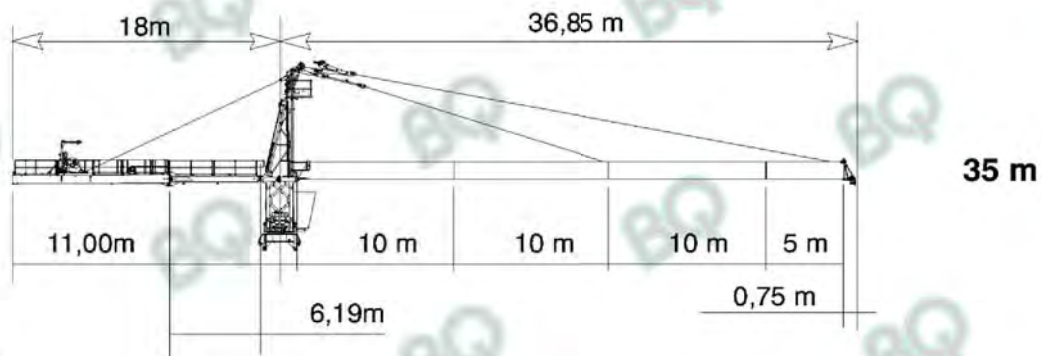
- The crane rope shall be placed in front (Drawing A) or back (Drawing B) of the chord on the jib.
- Do not fix the pull rod between crane ropes with pin at the hoisting point.
- At the position of double pull rods, insert the rope between the rods.
- Select two crane ropes in corresponding diameter and length according to weight and dimension of the part to be hoisted.



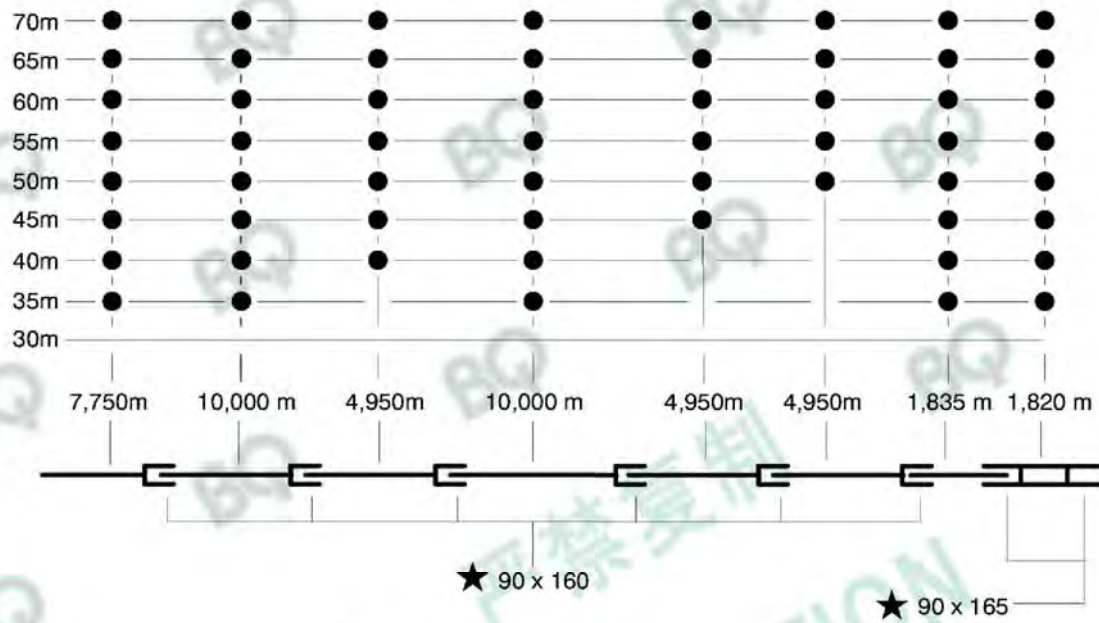
1 Composition of the Jib and Pull Rod



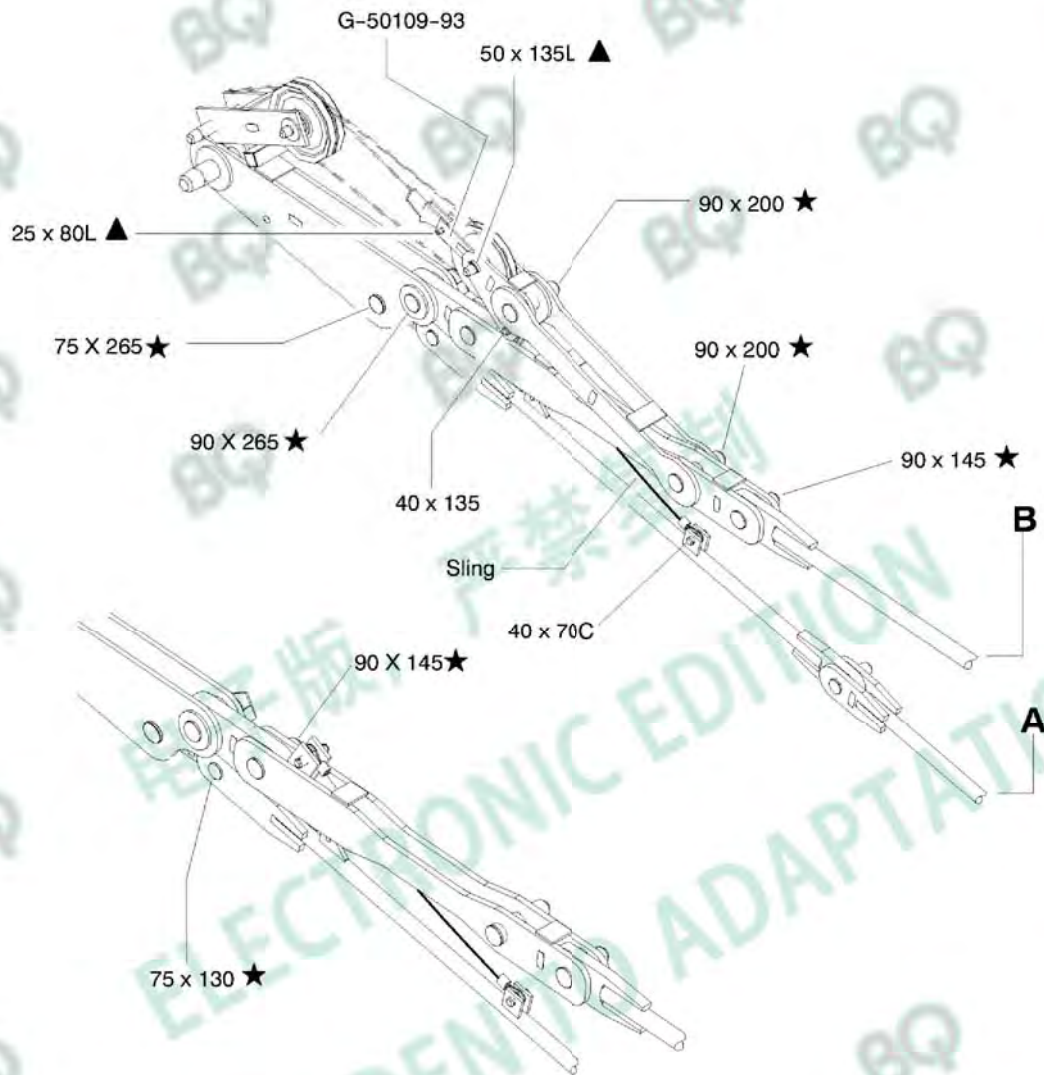




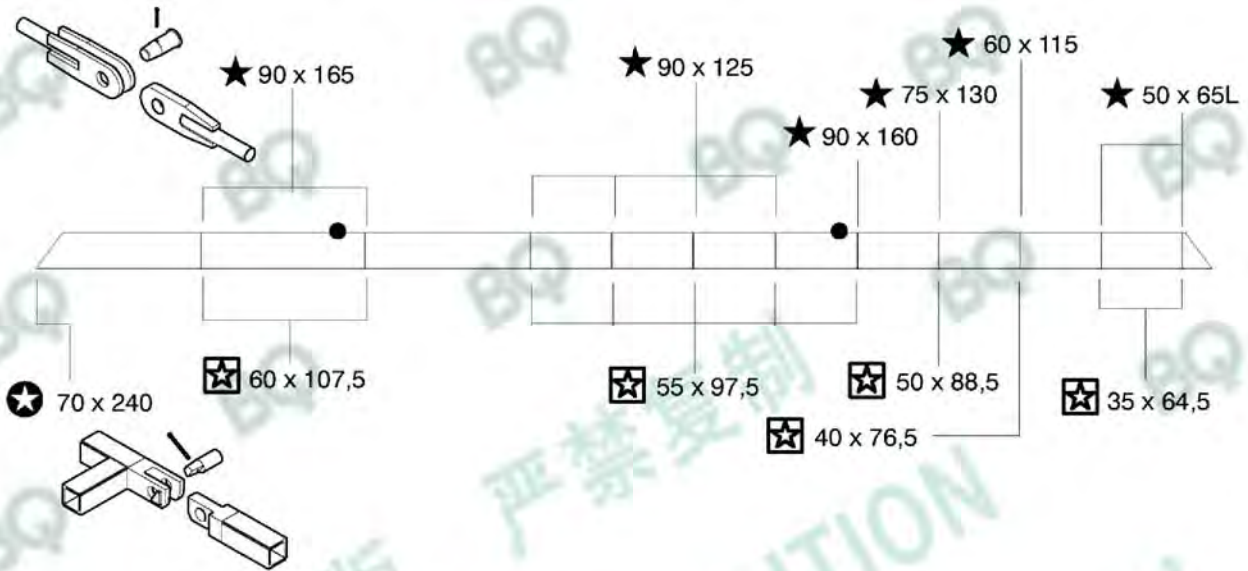
1.1 Long Pull Rod System



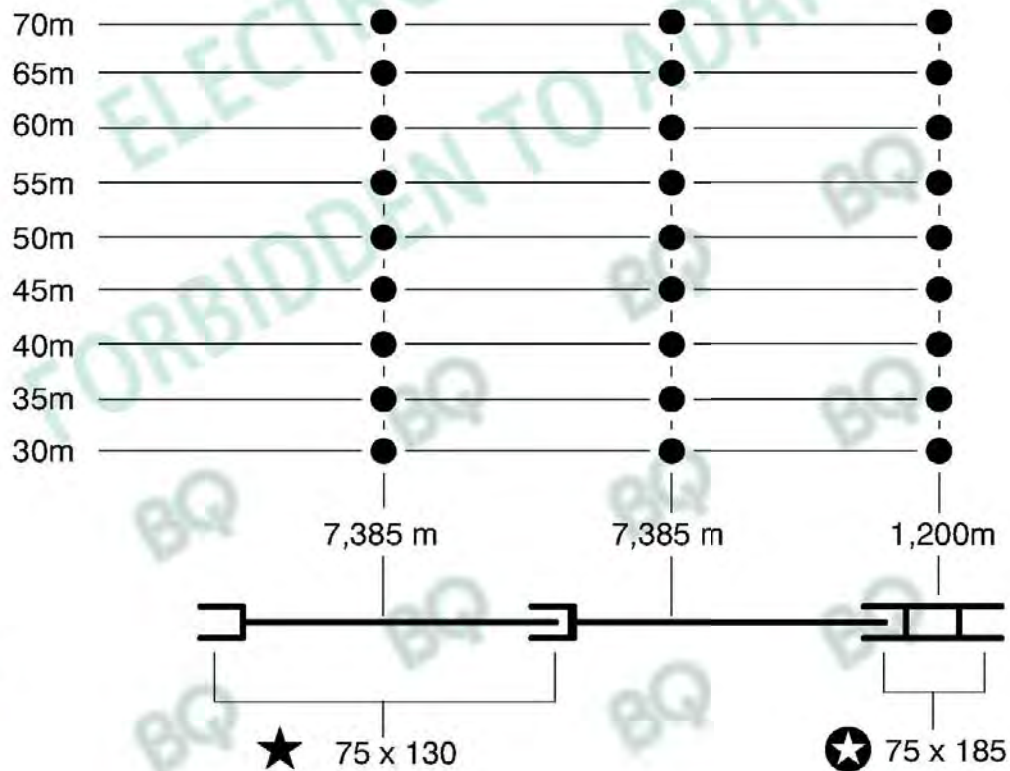
1.2 Hanger Plate



1.3 Shaft Pin

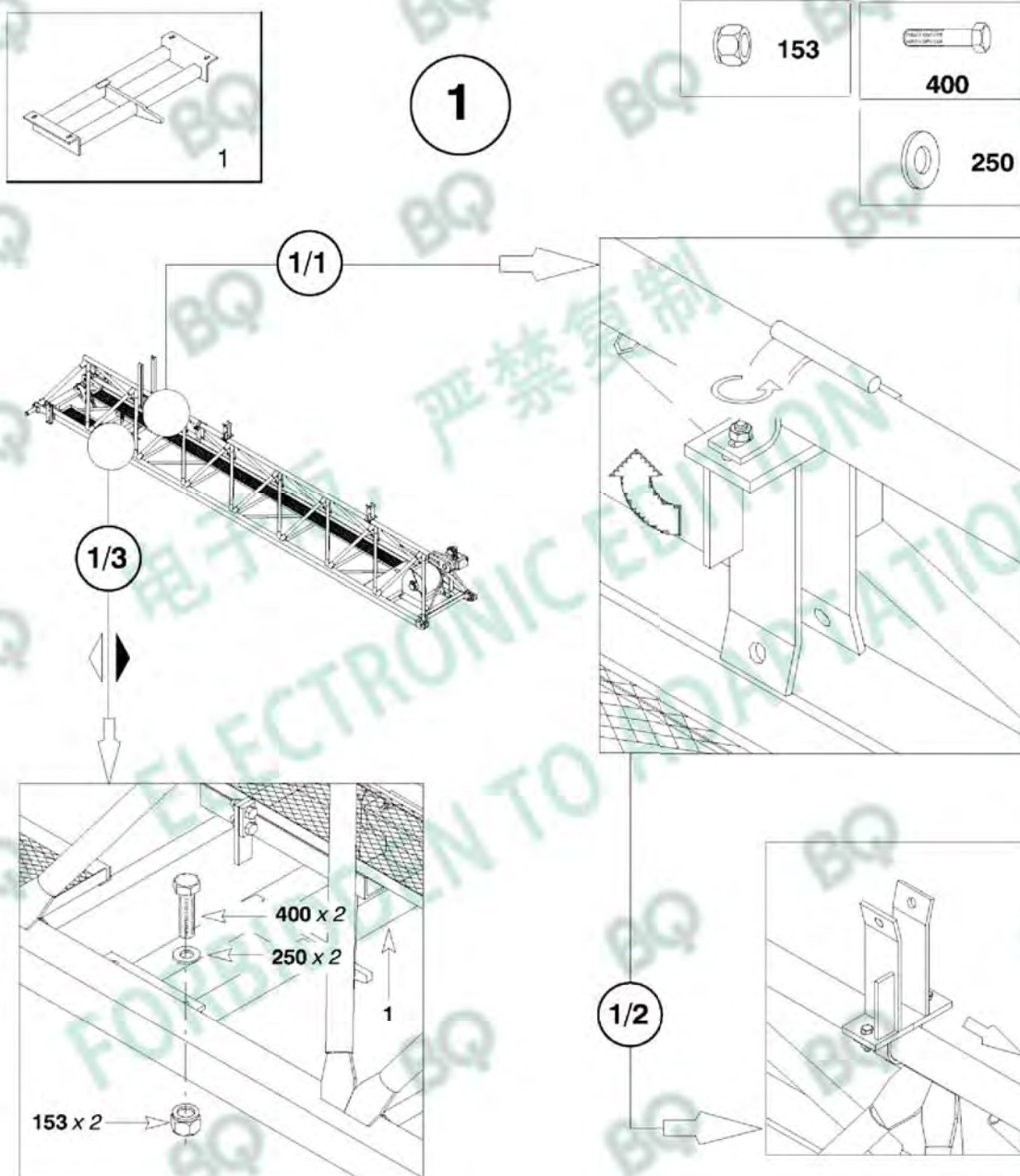


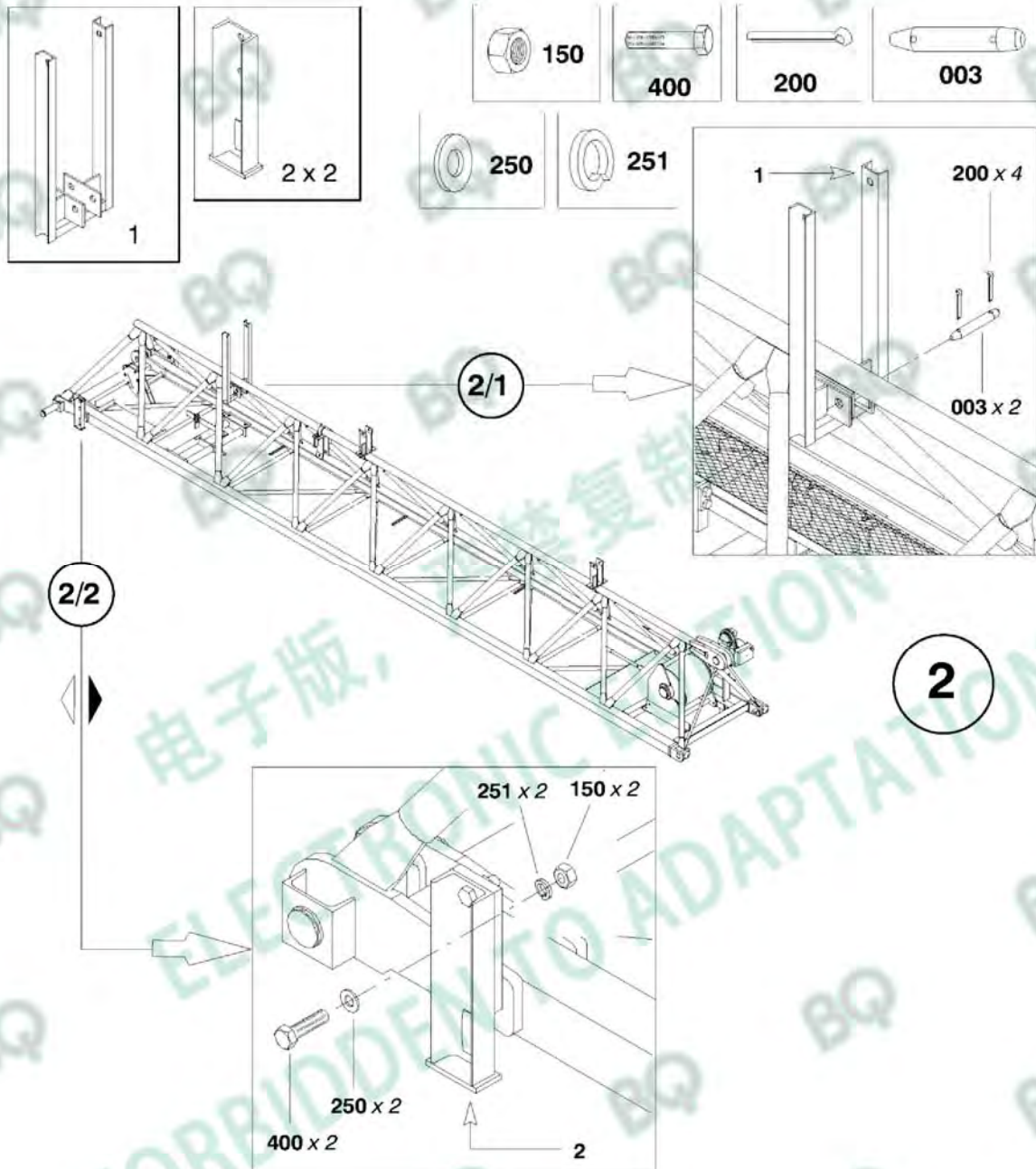
1.4 Short Pull Rod System

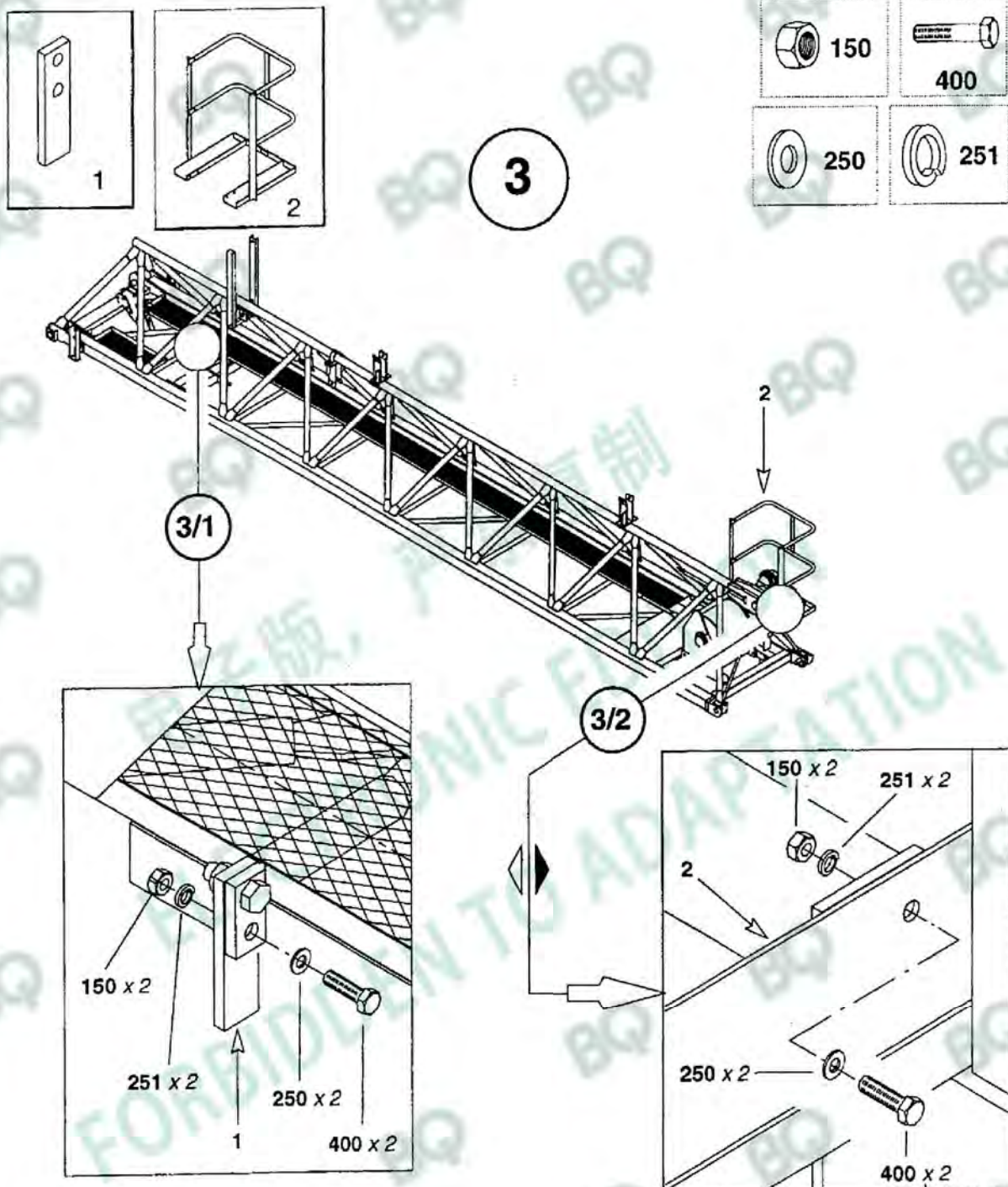


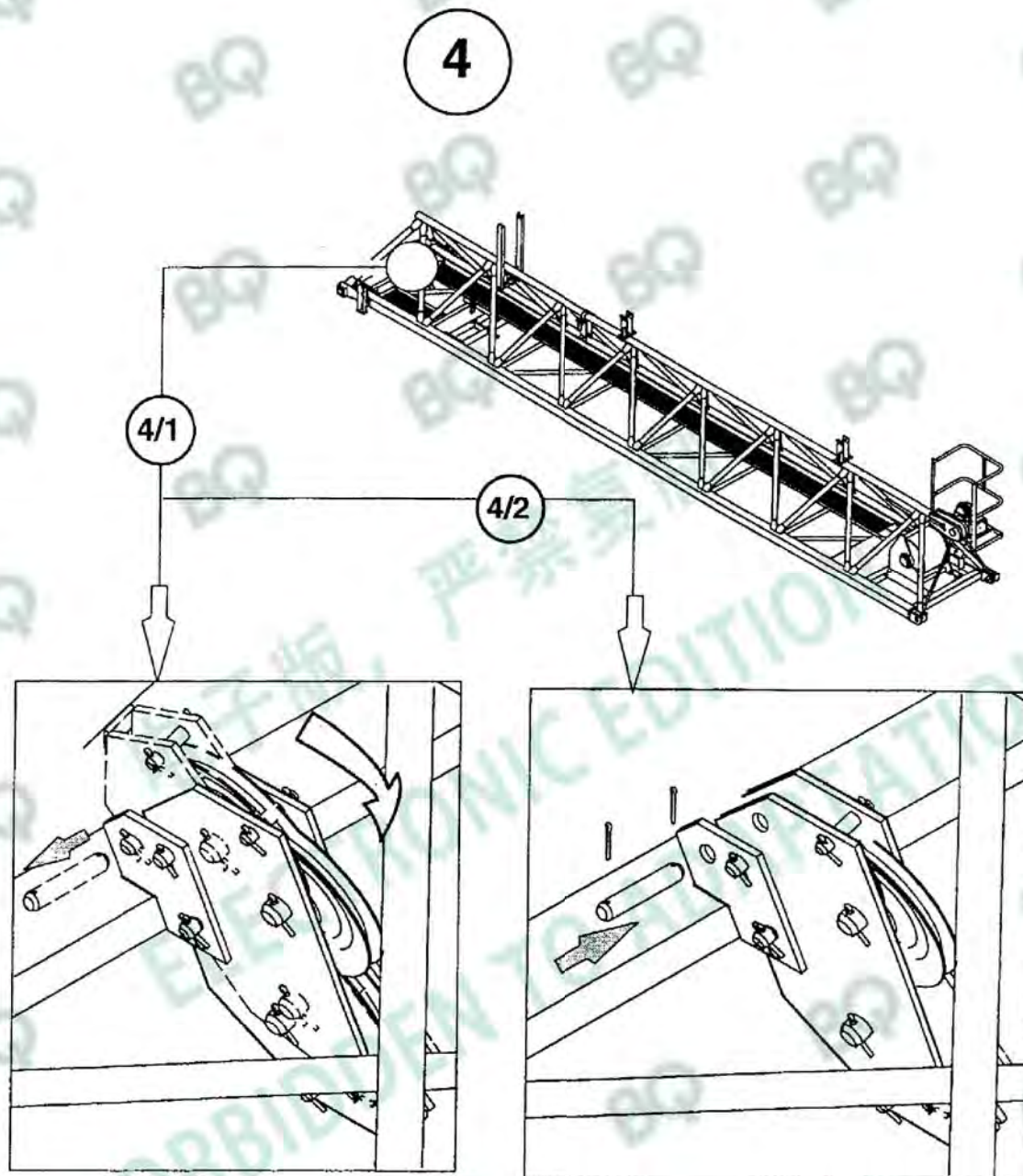
2 Preparation and Assembly of the Jib

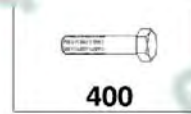
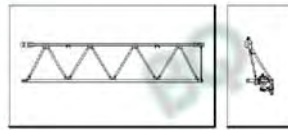
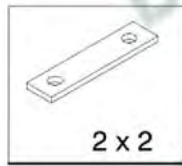
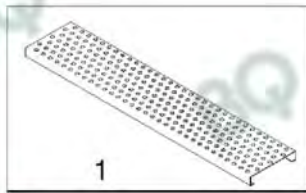
2.1 Assembly of Jib Sections







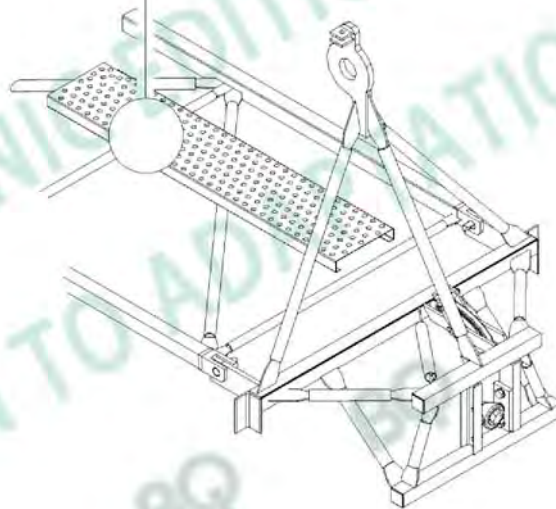
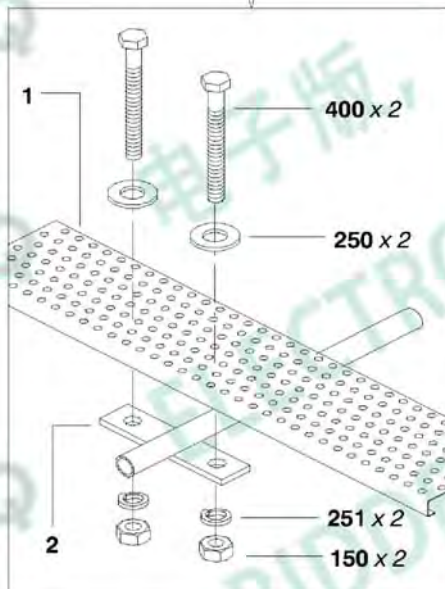


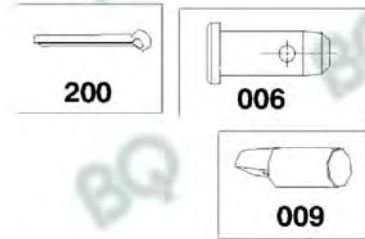


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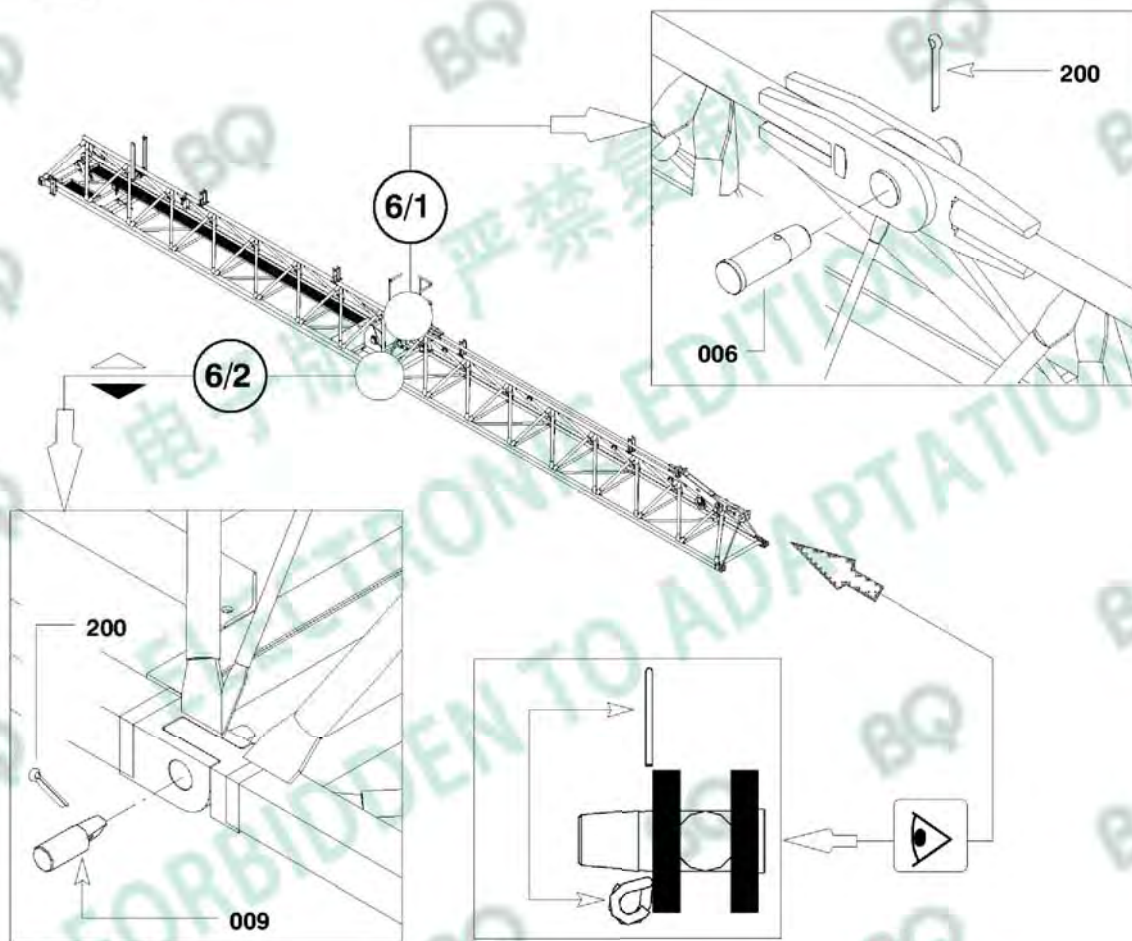


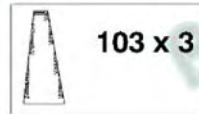
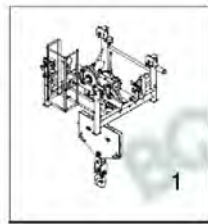
5/1



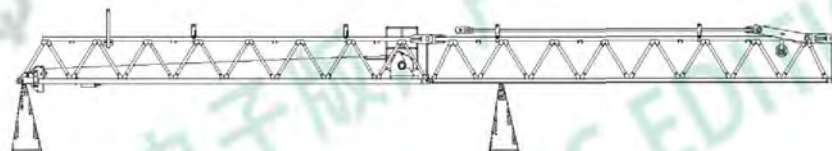


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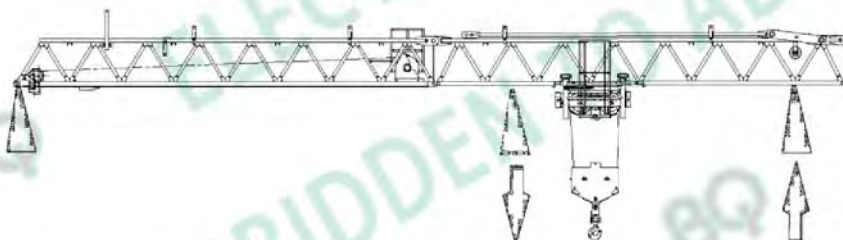
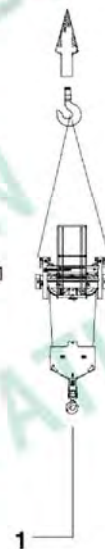




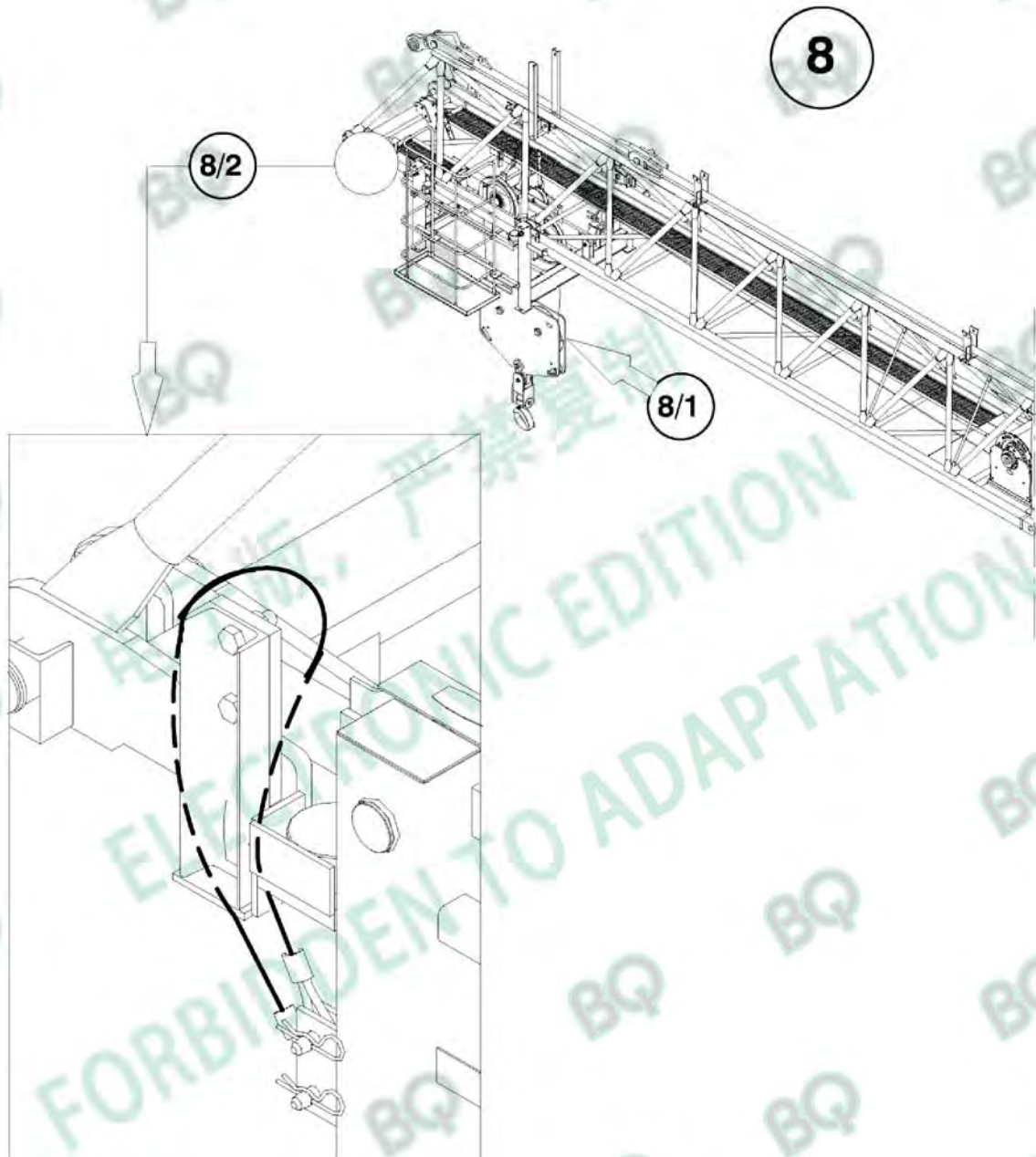
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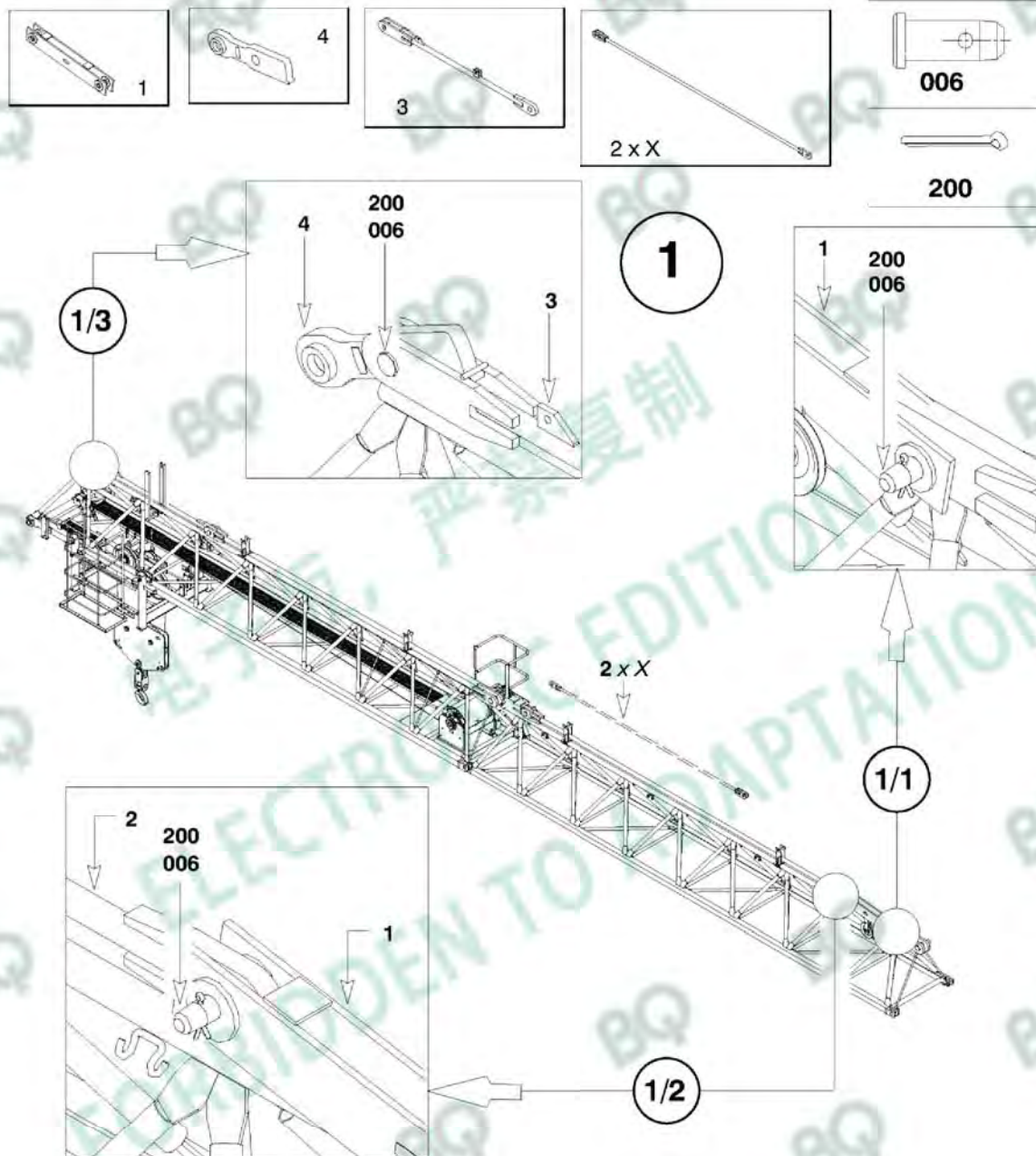
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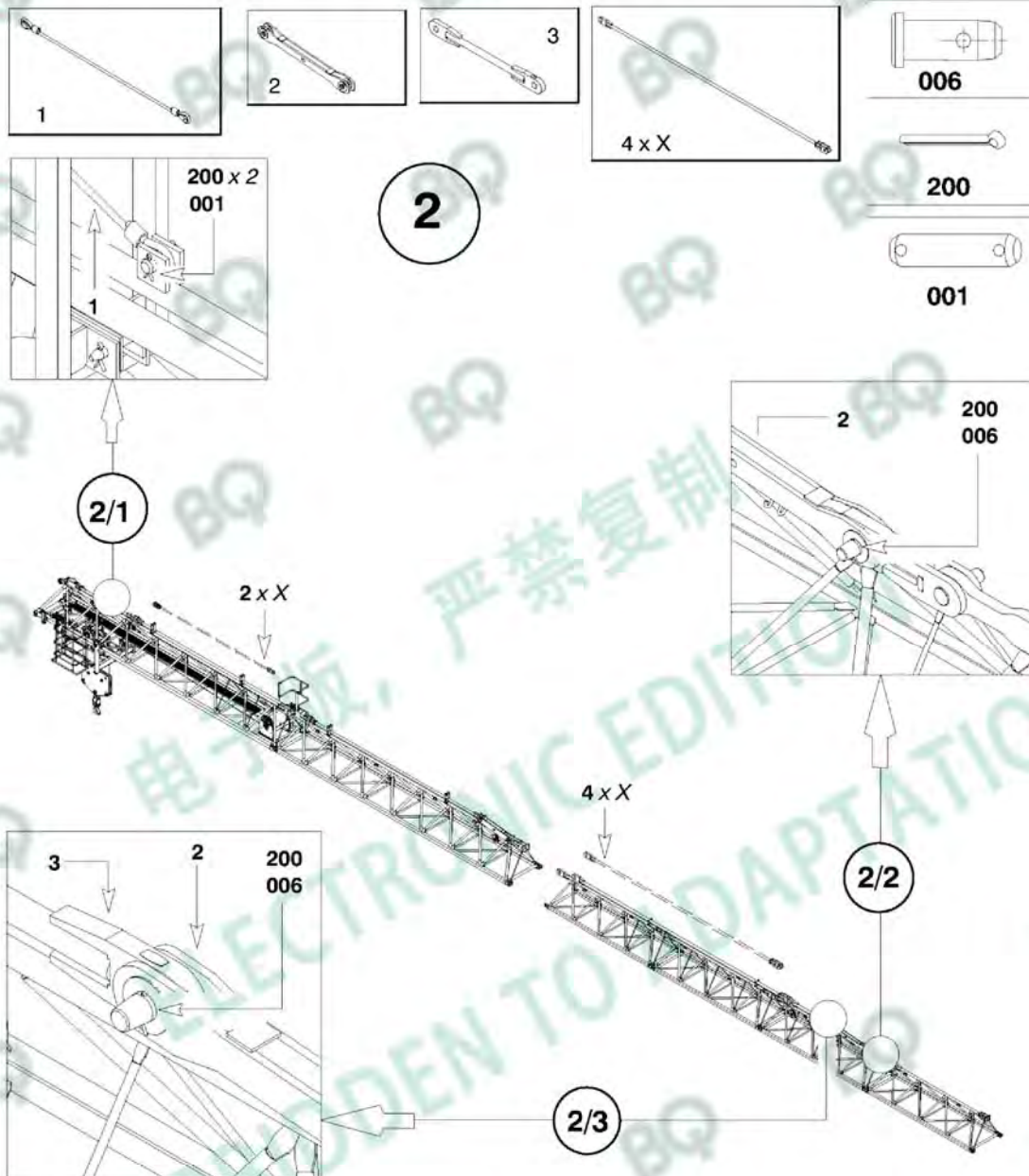


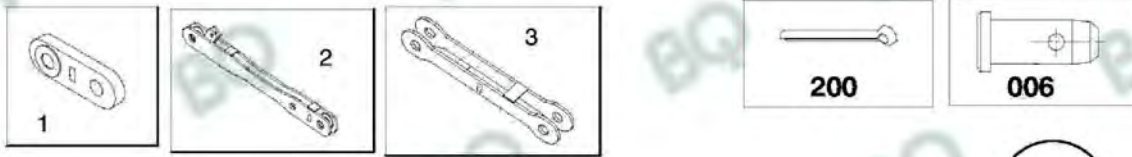
7/2



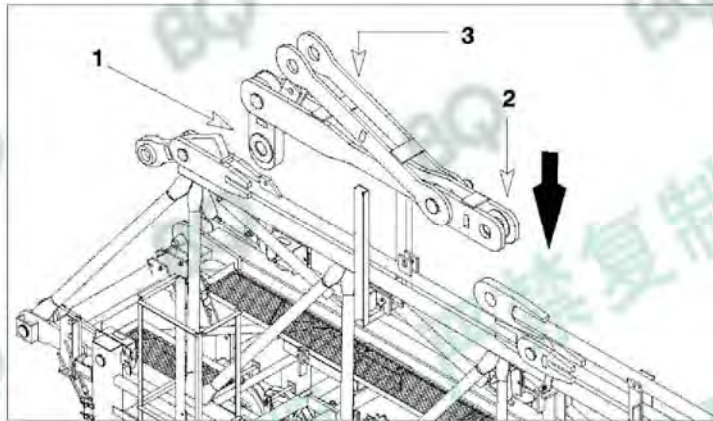
2.2 Preparation of Pull Rod



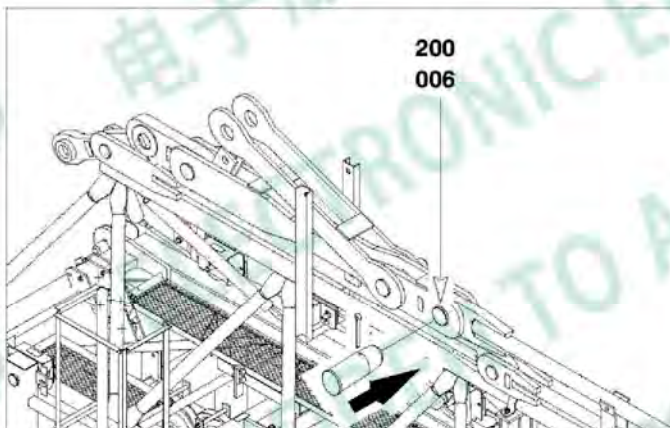




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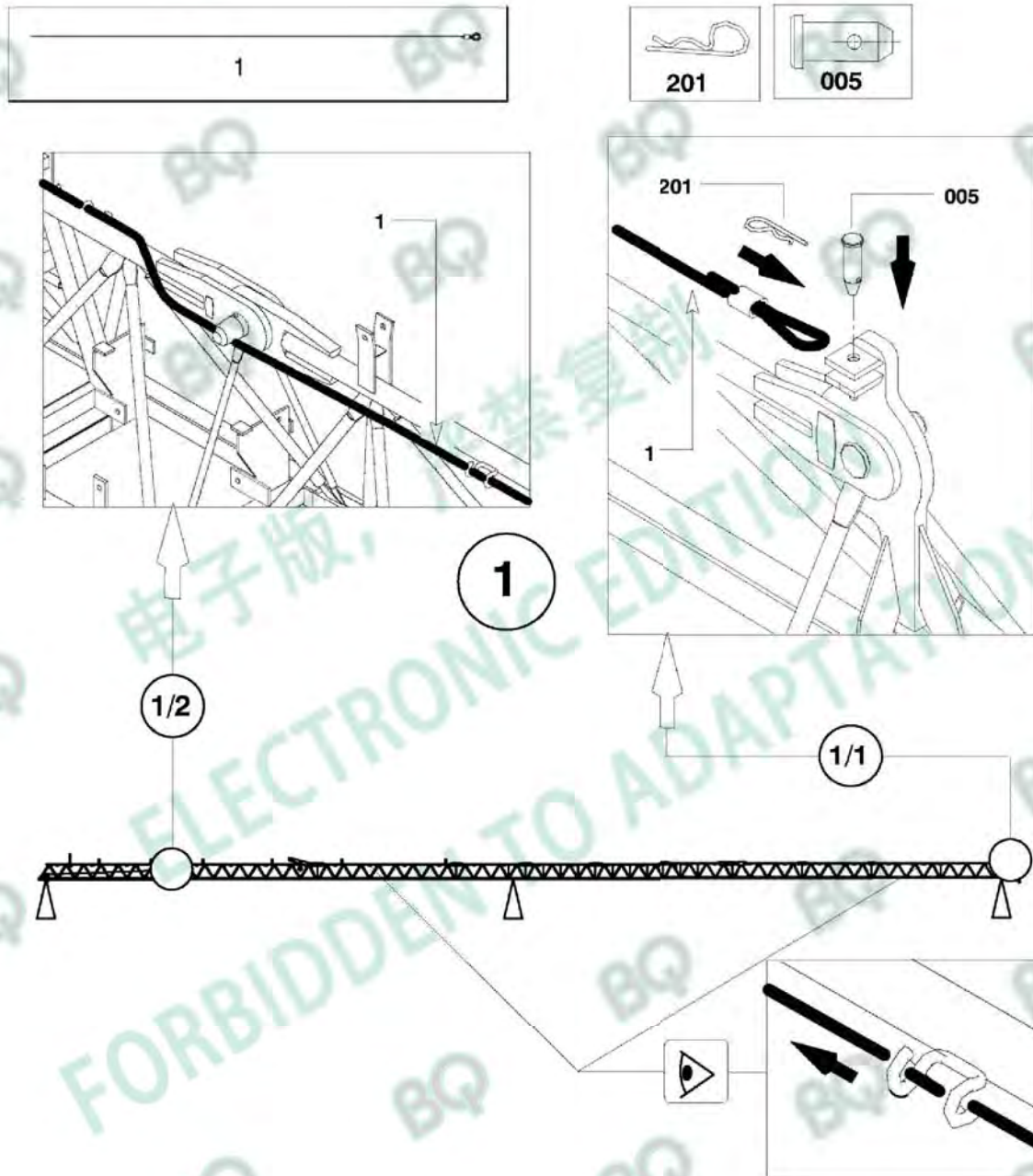
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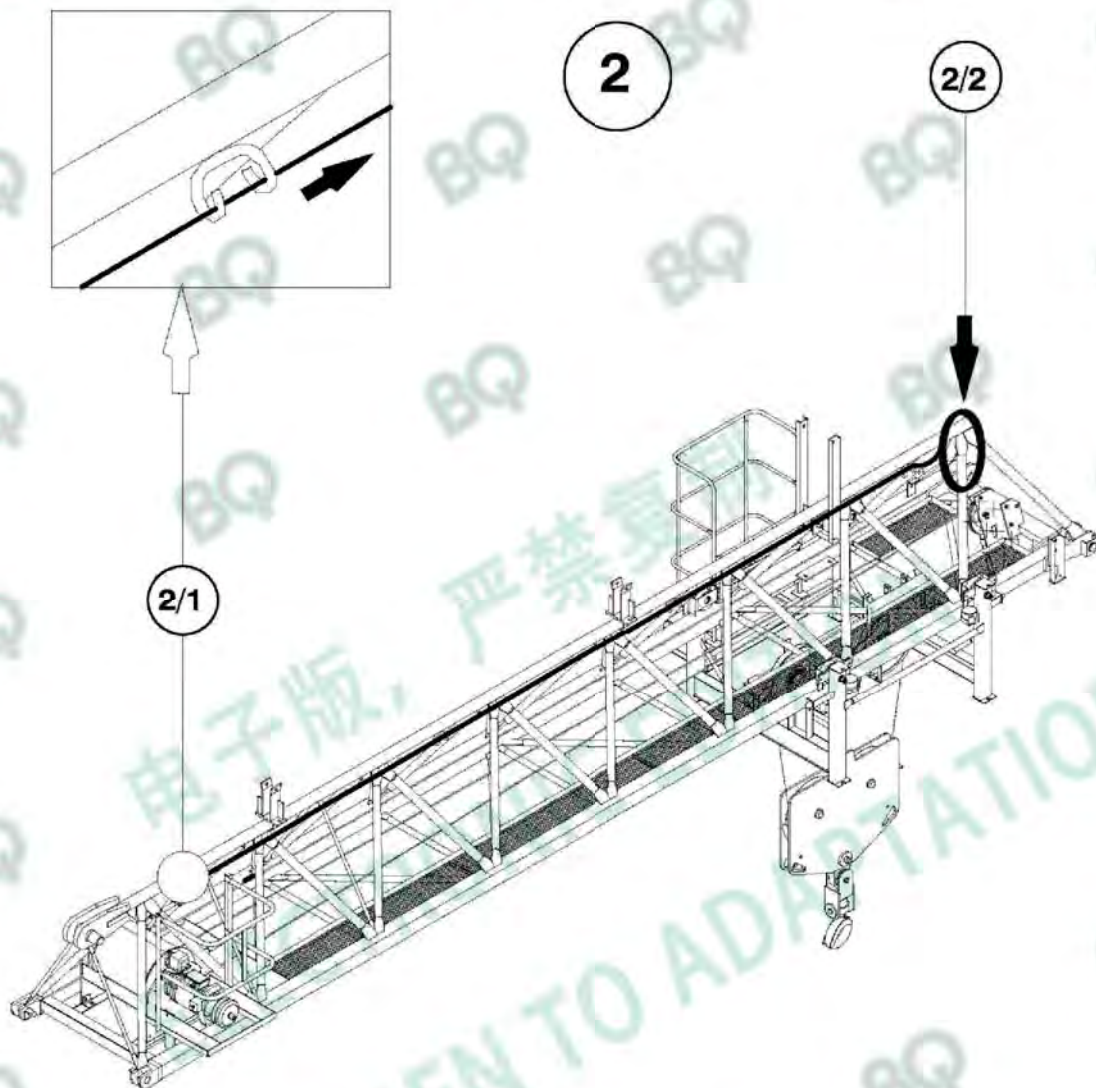


3/2

2.3 Safety Wire Rope

Note: keep the safety wire rope in good condition.



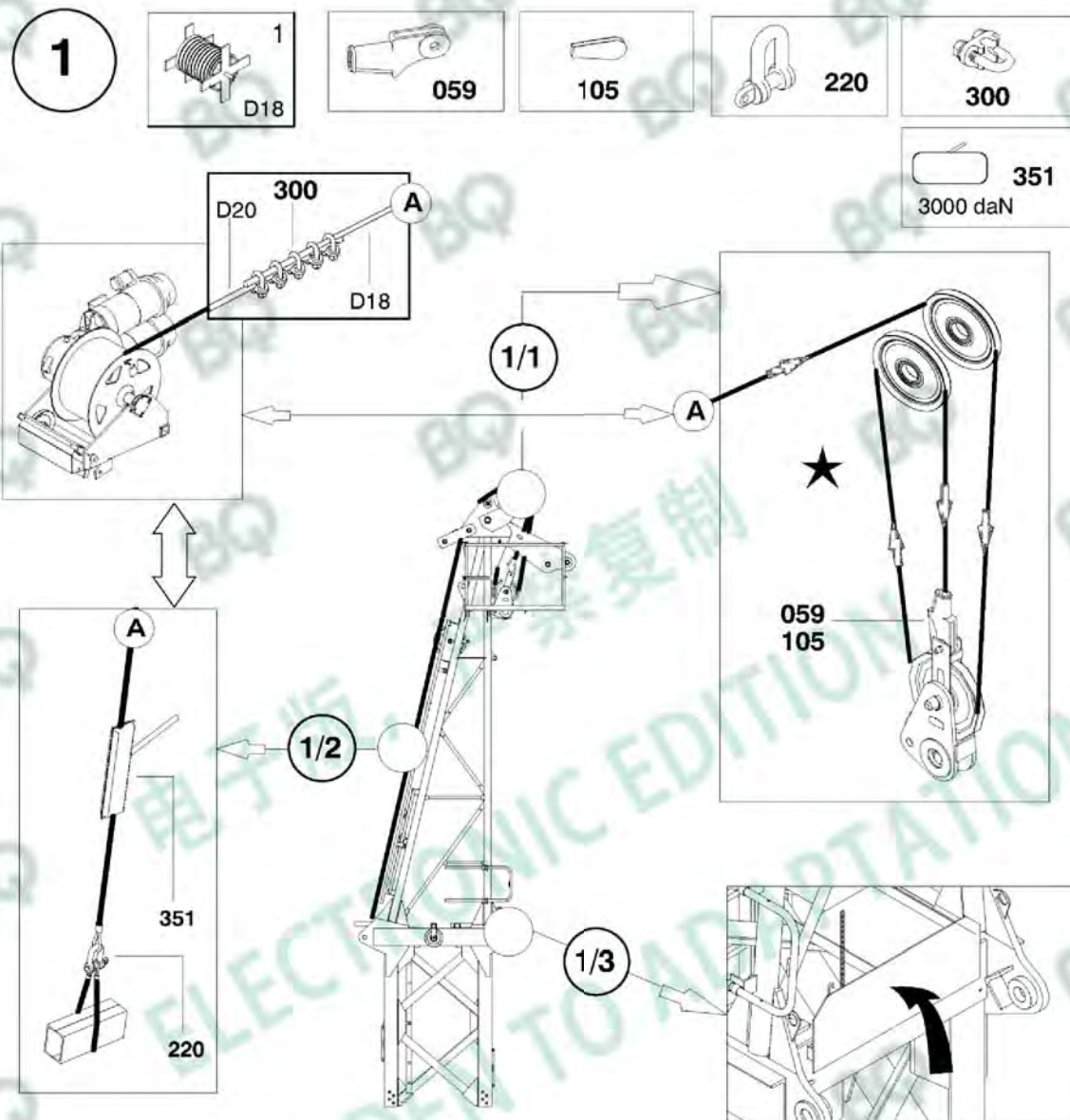


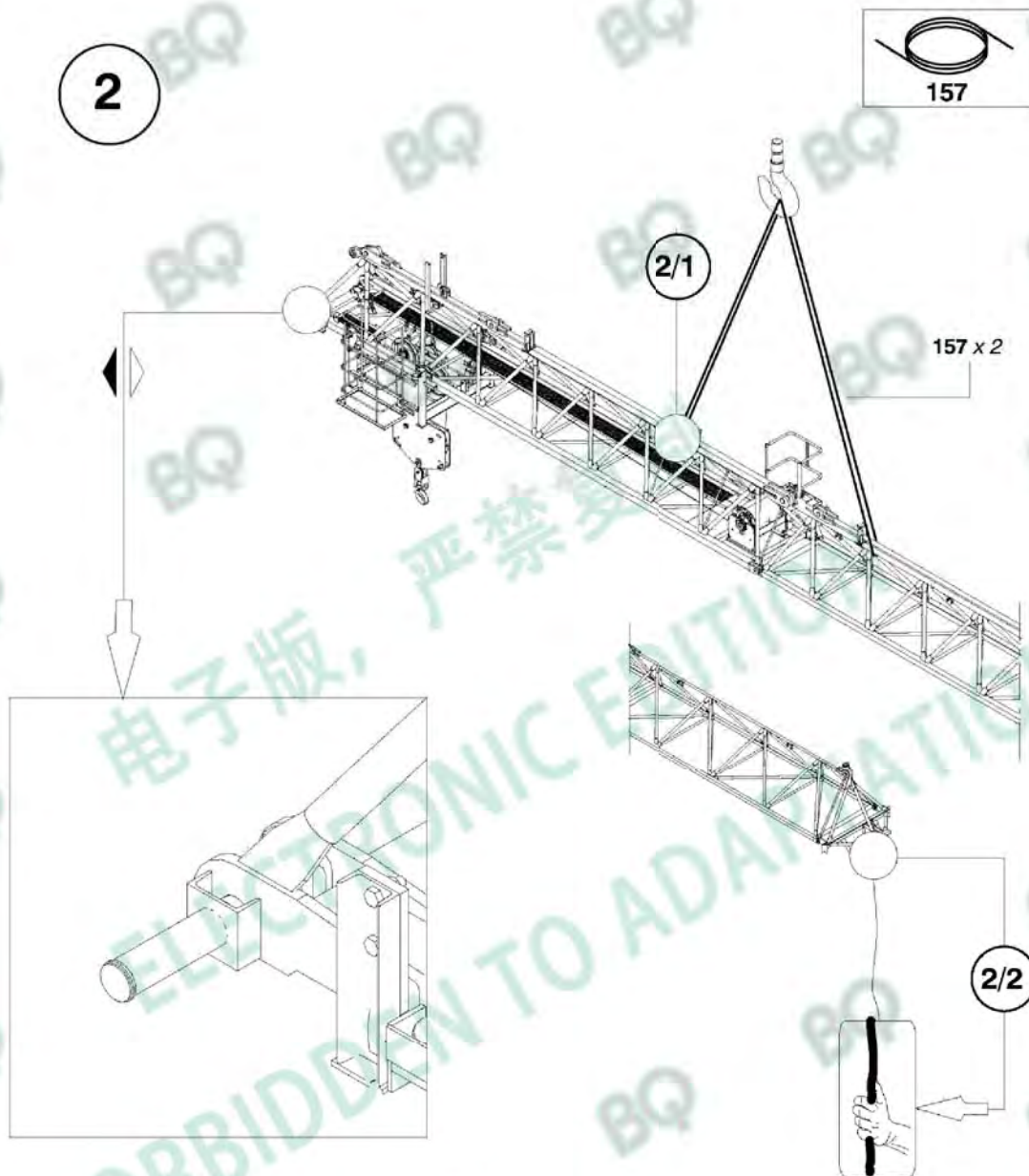
3 Jib Hoisting

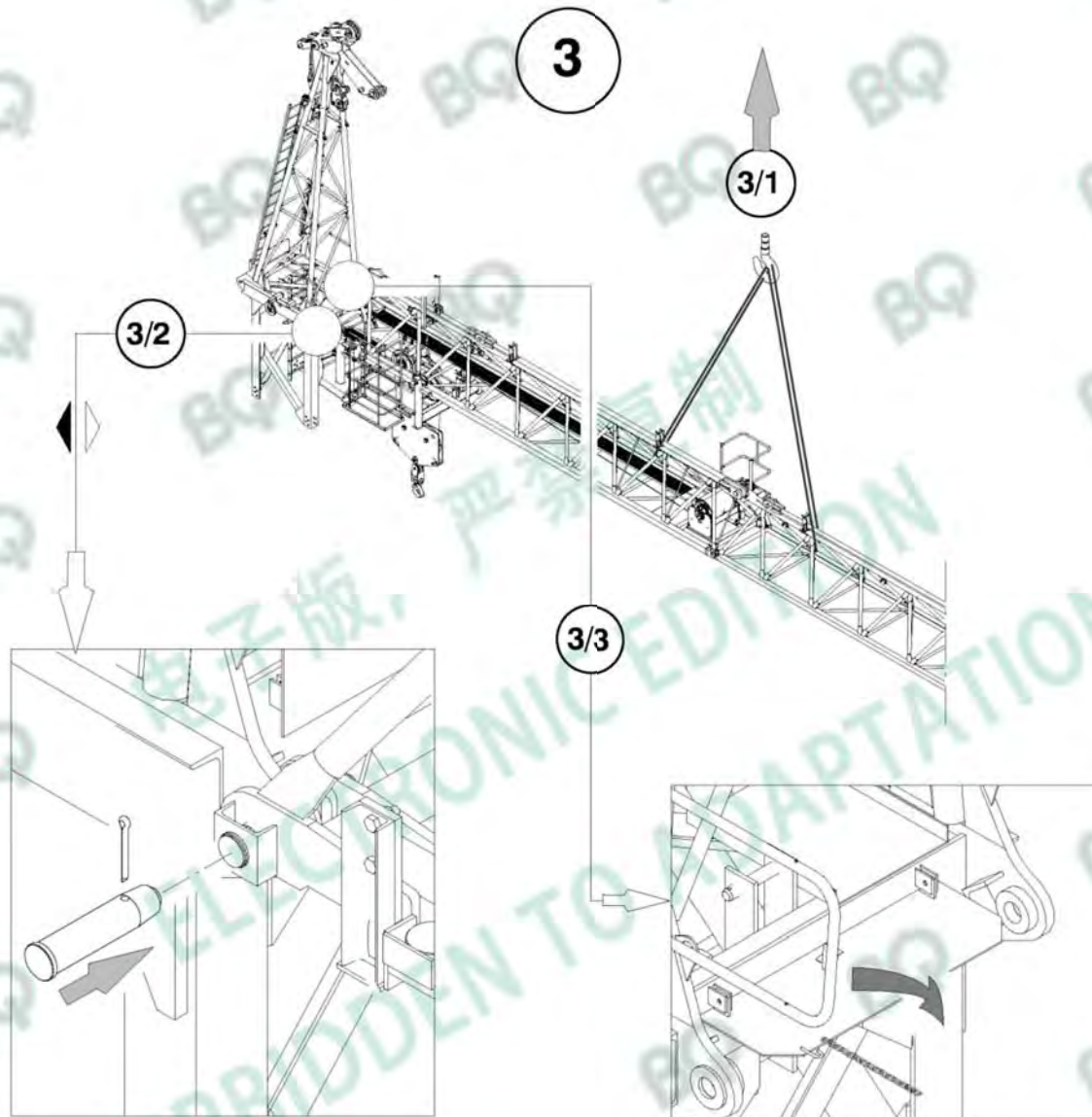
3.1 General Rules:

- Safety belt, which is fixed on the tower cap, must be used for operation at root of the jib.
- Please crane ropes in diameter compatible with the load to be hoisted and keep the ropes in good condition.
- When connecting with pins, slow down the moving speed to avoid swing.
- Partial ballasts must be provided for some jib lengths.

3.2 Fixing the Jib Root with Pins

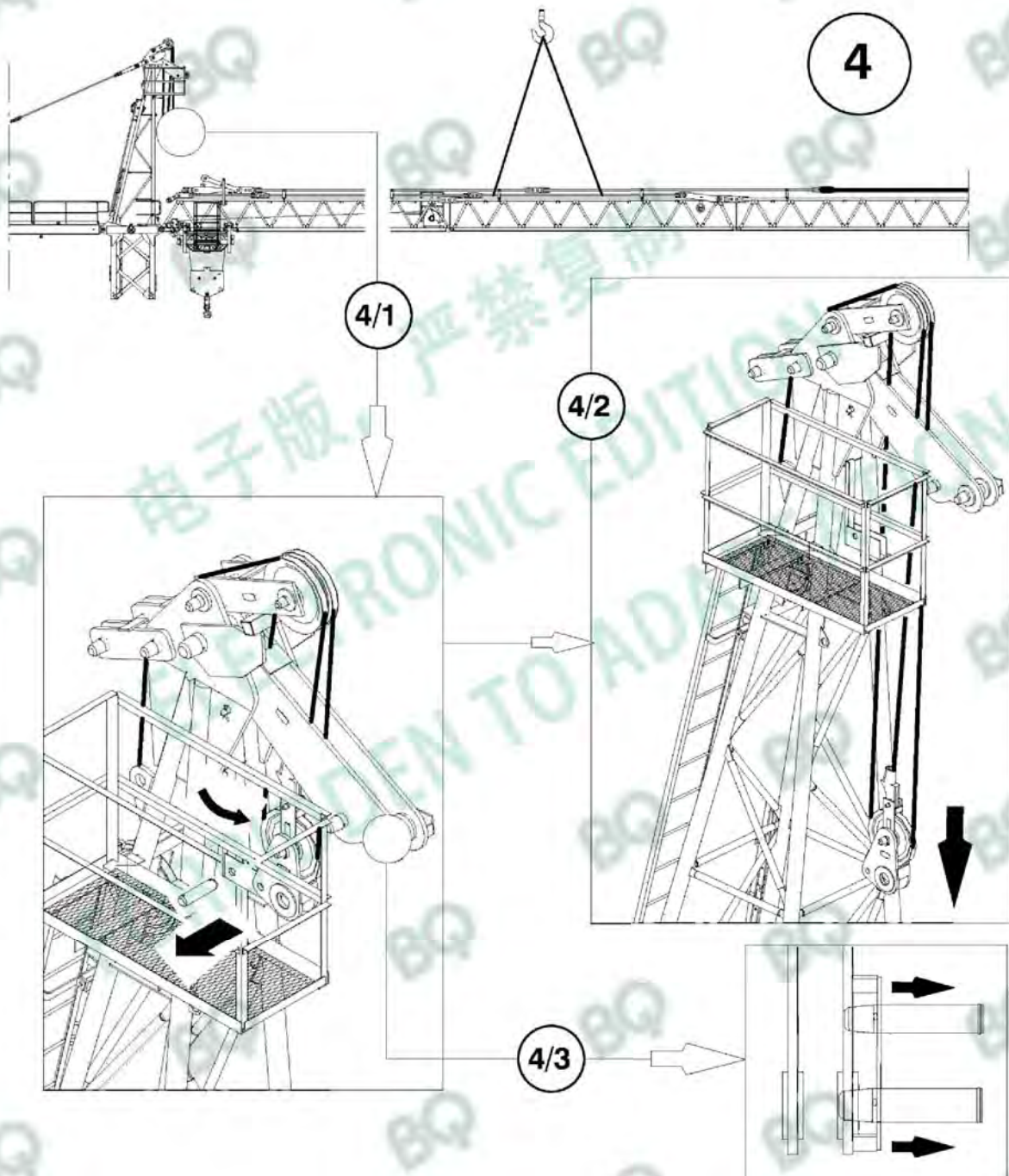


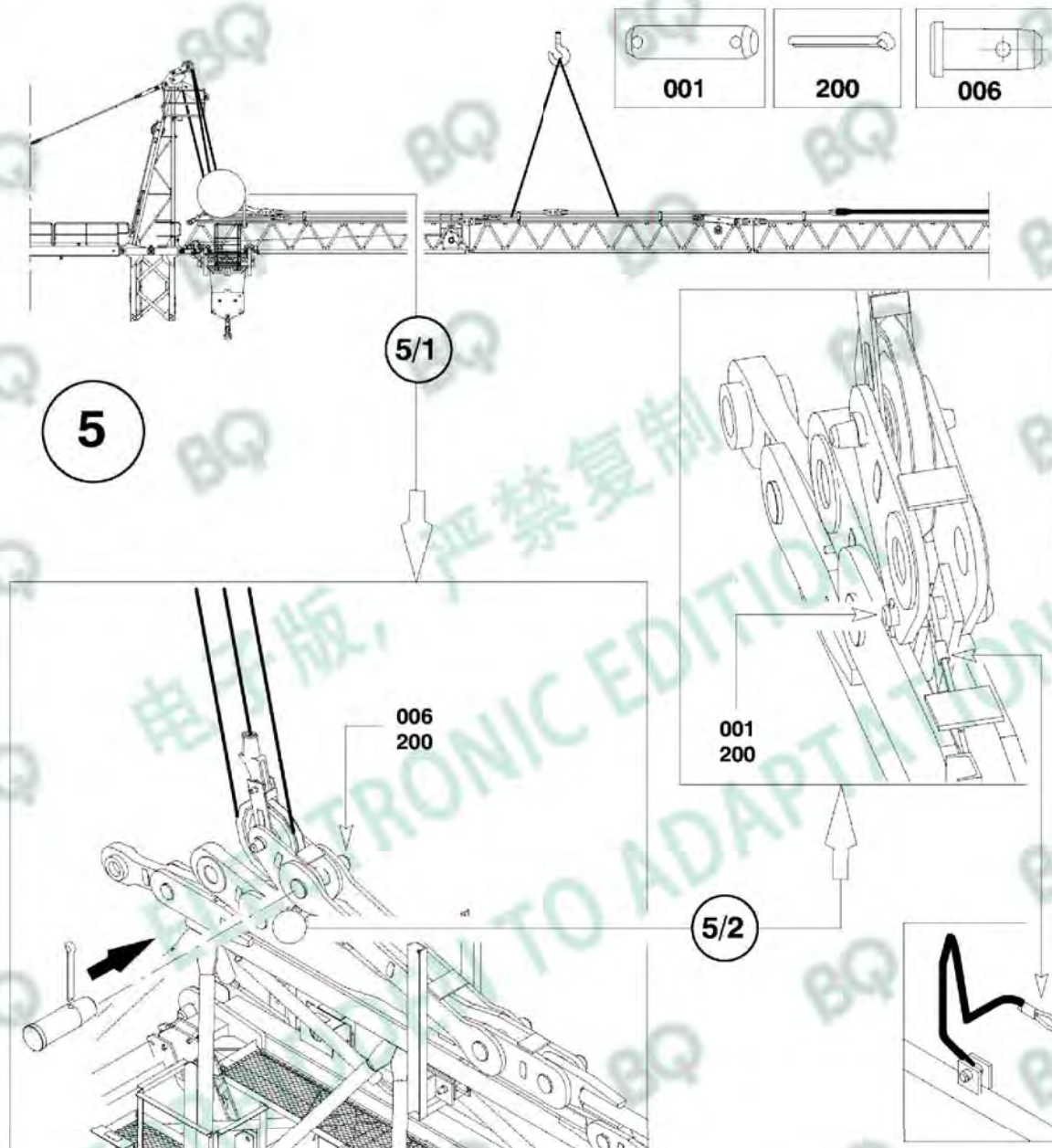


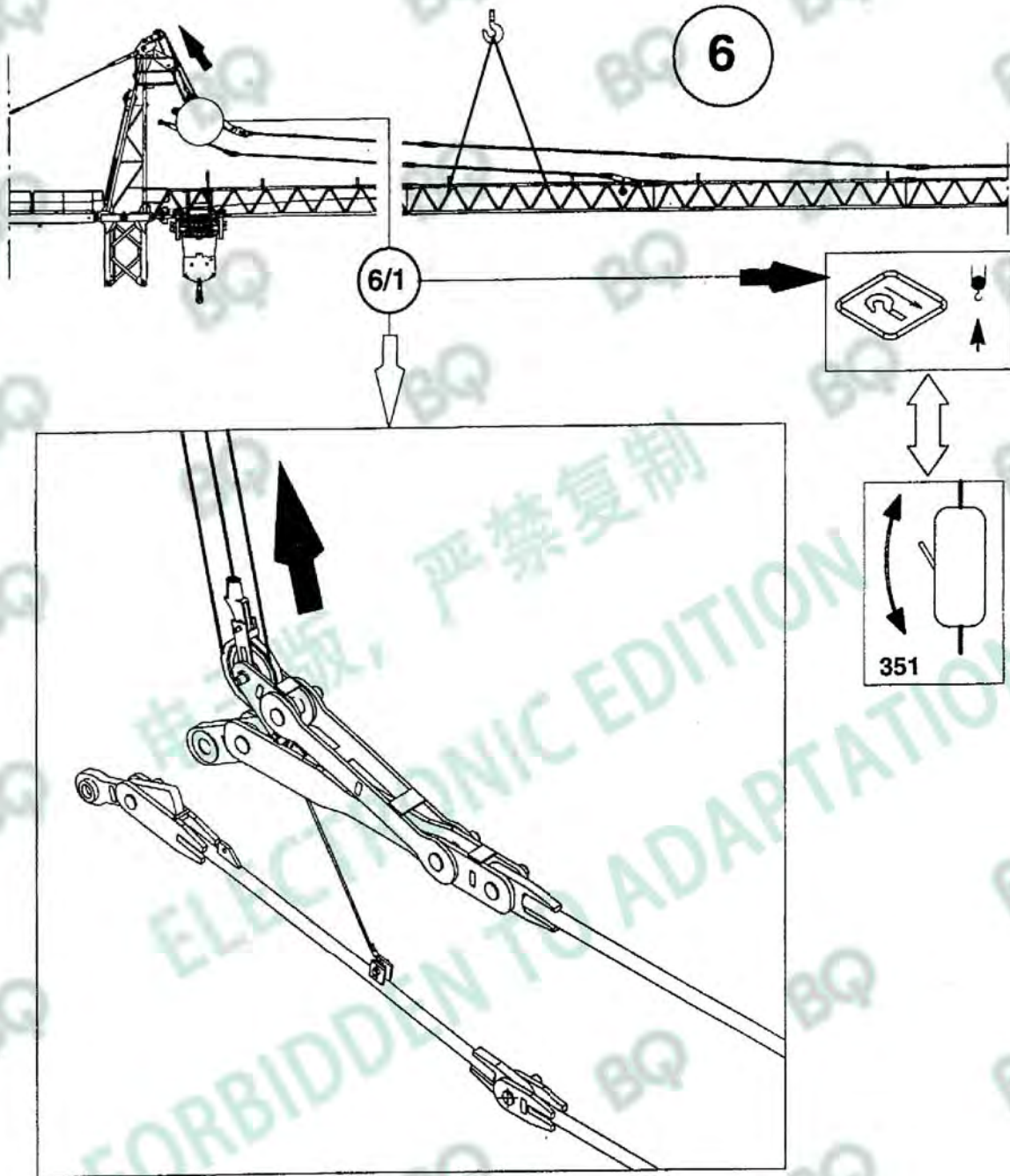


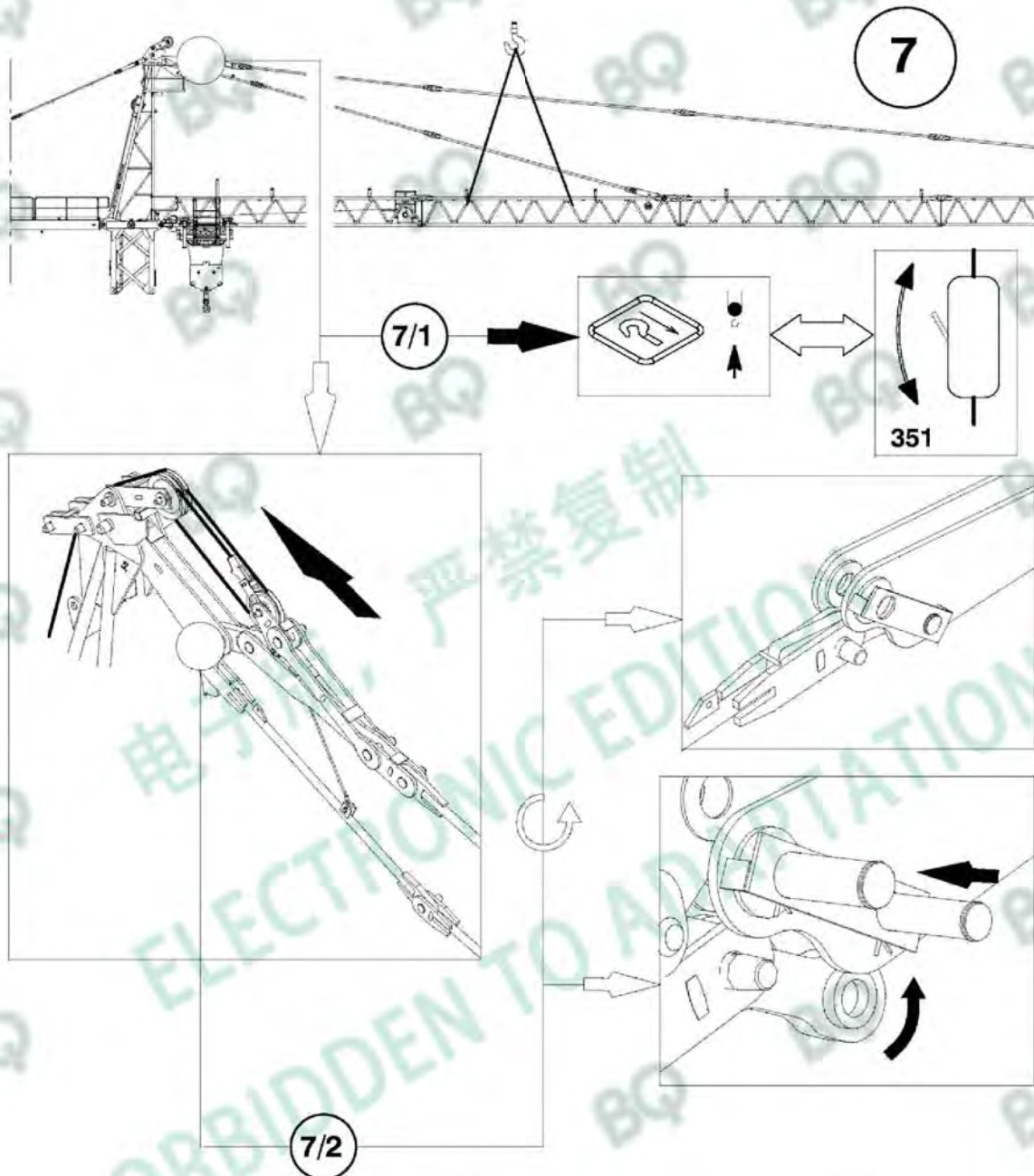
Fixing the pull rod on the tower cap with pins

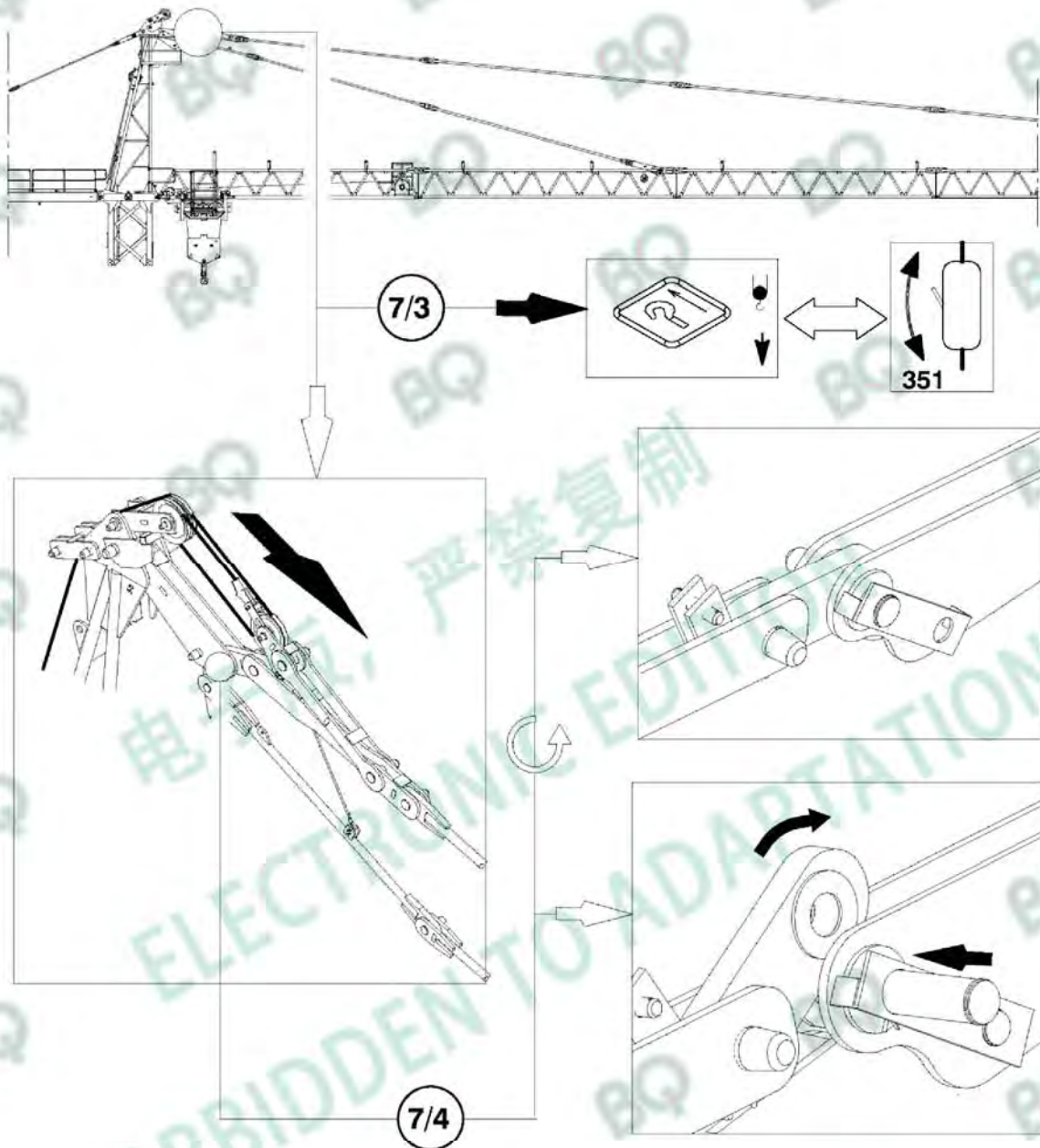
Ropes must be wound tightly and the pull rod system must be fixed by pins.

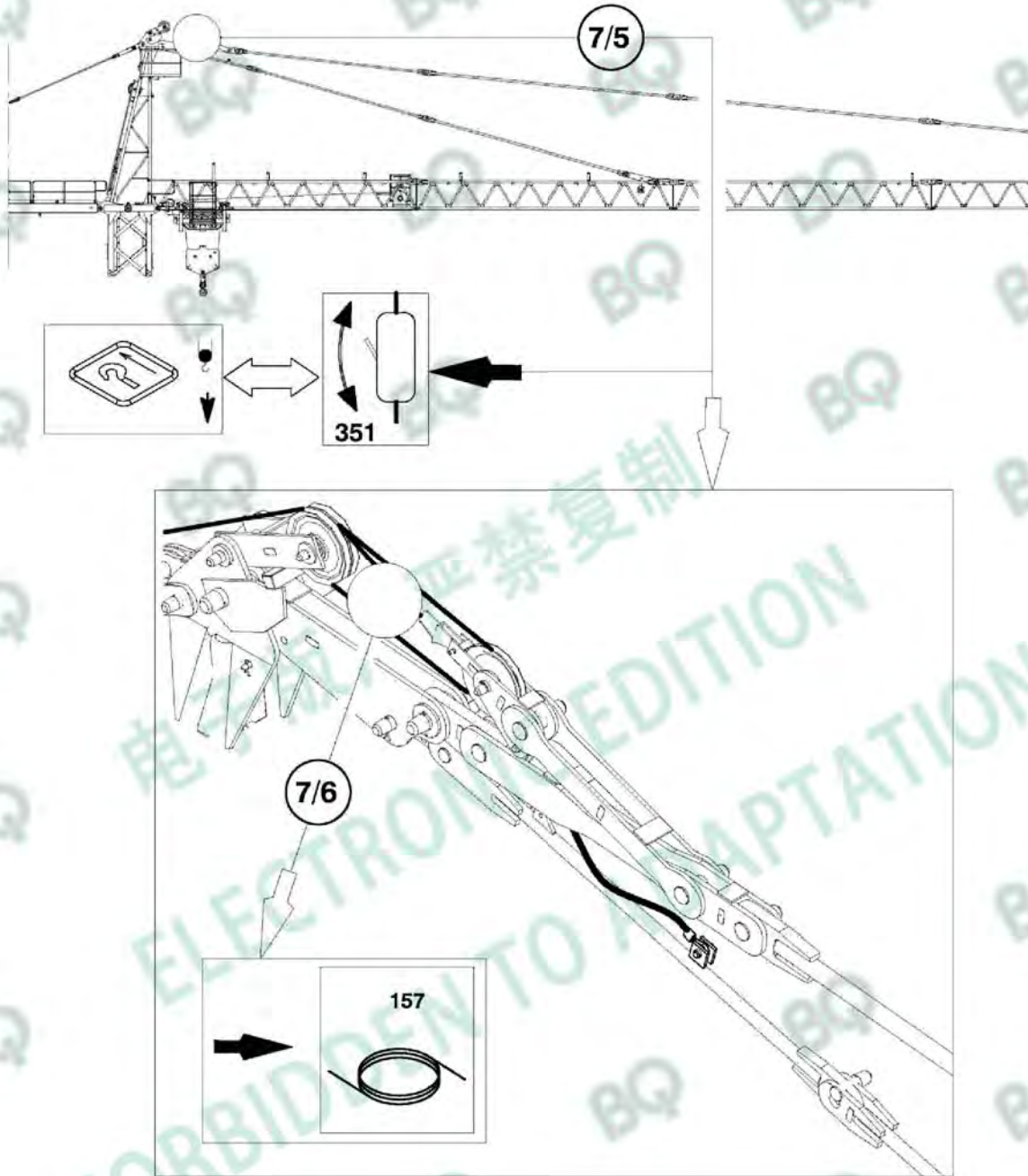


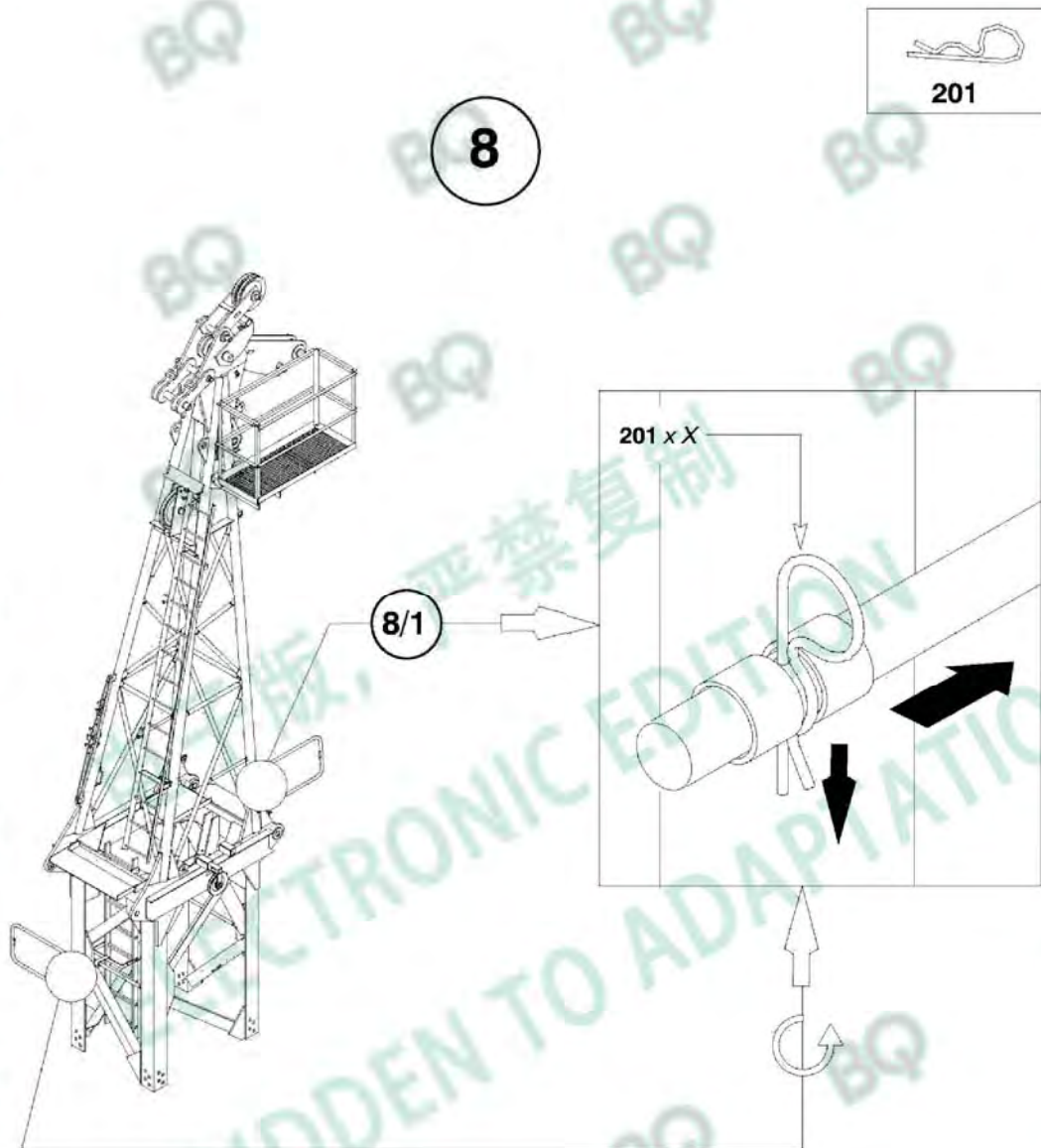


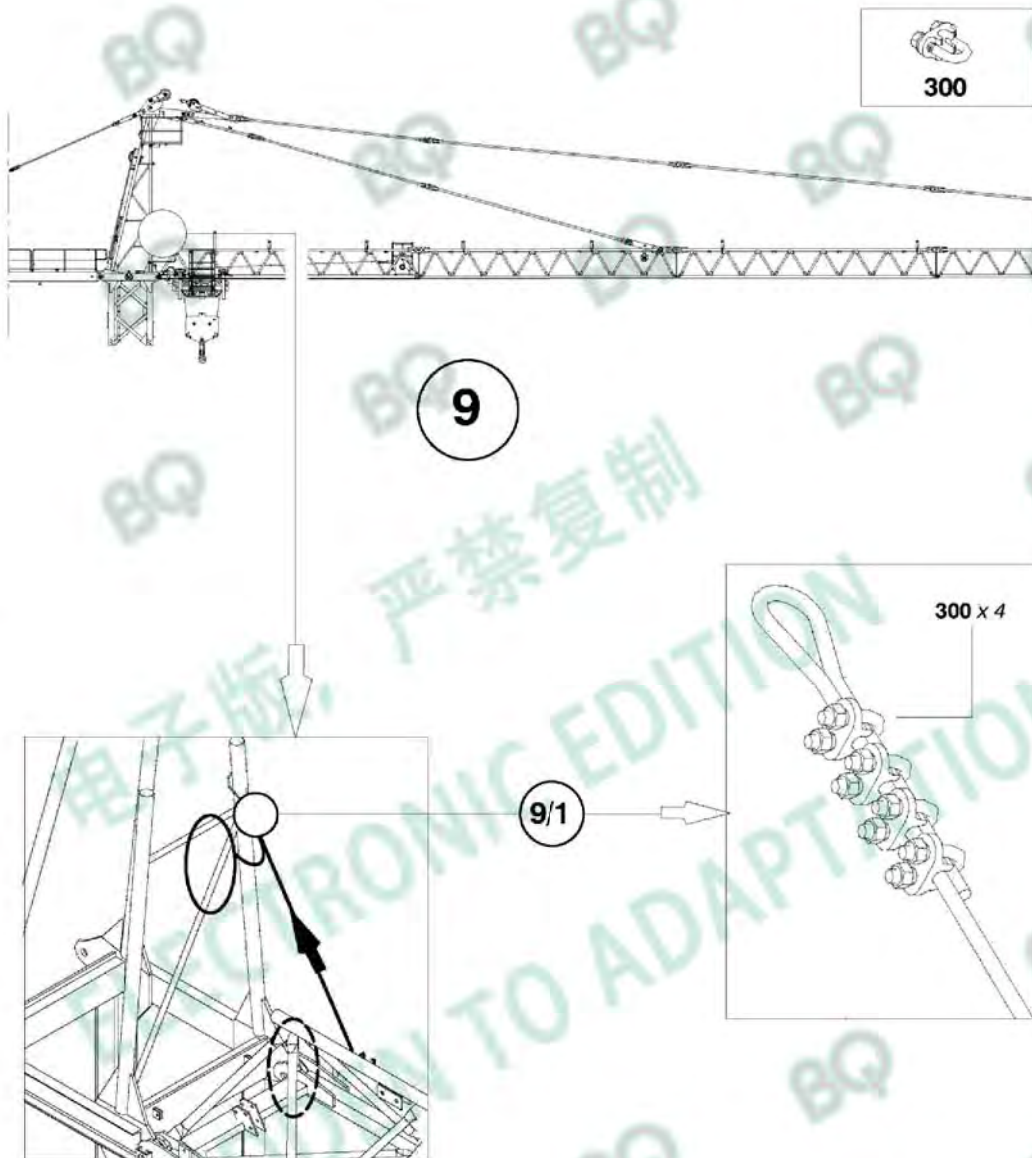






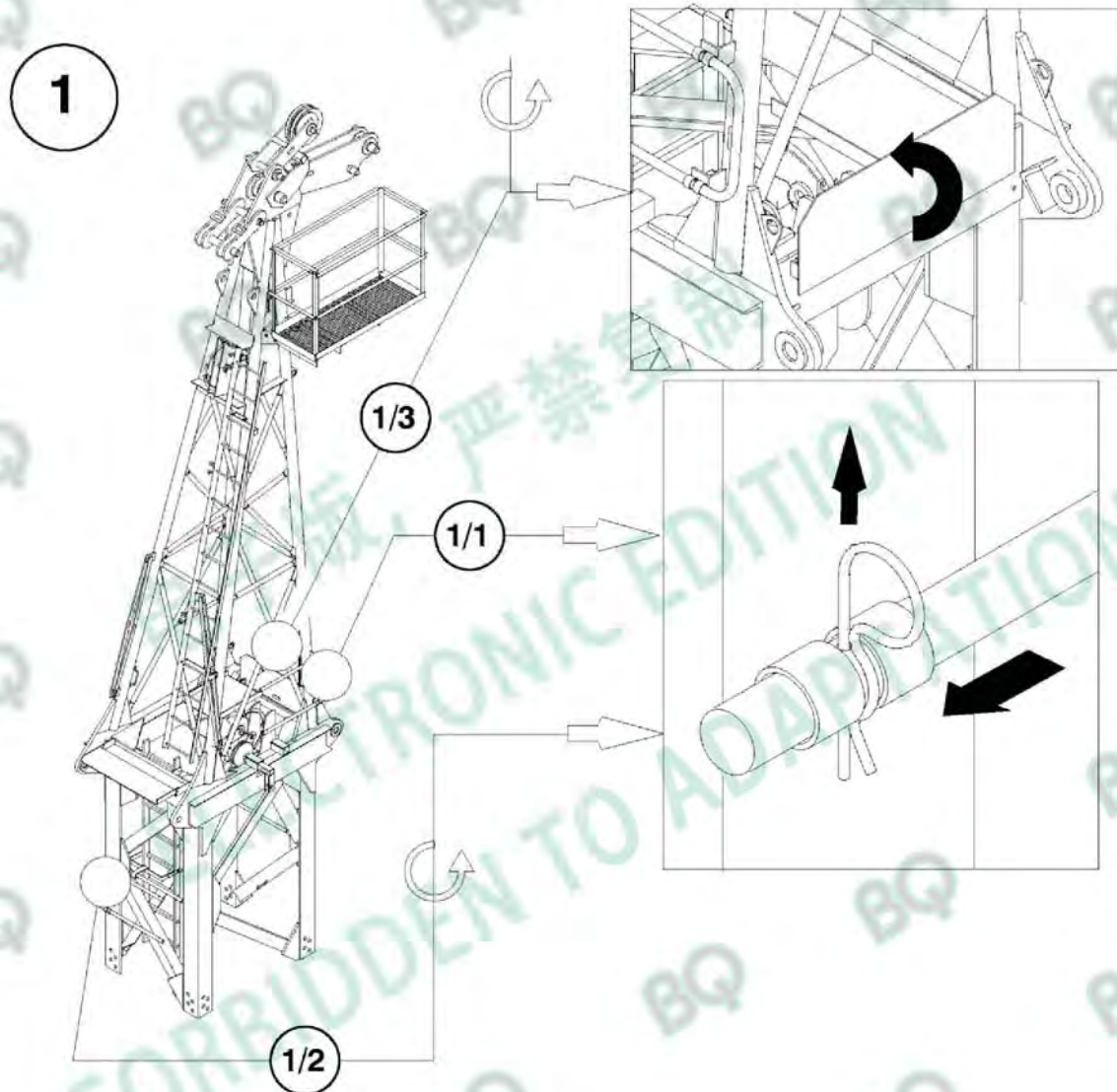


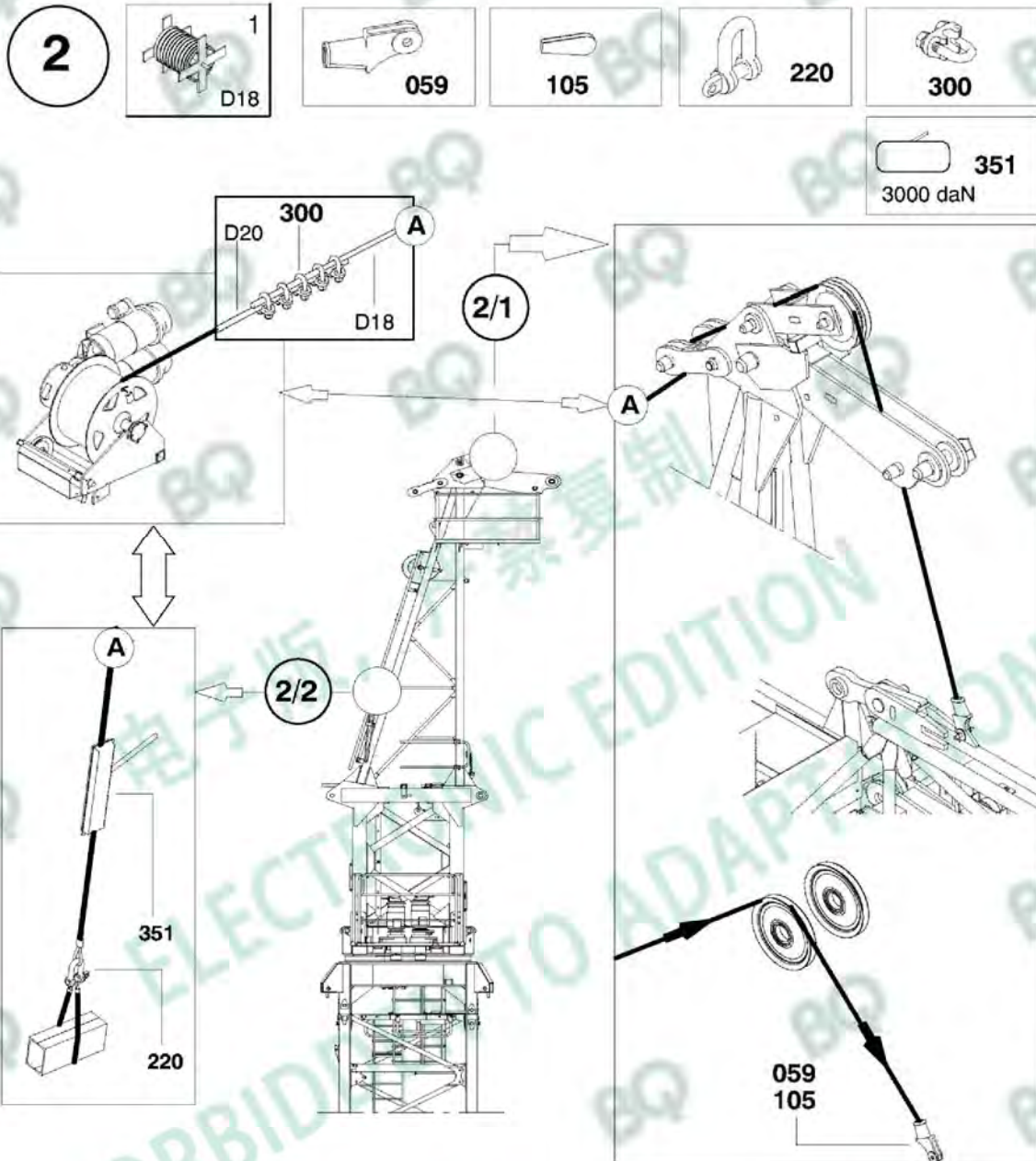


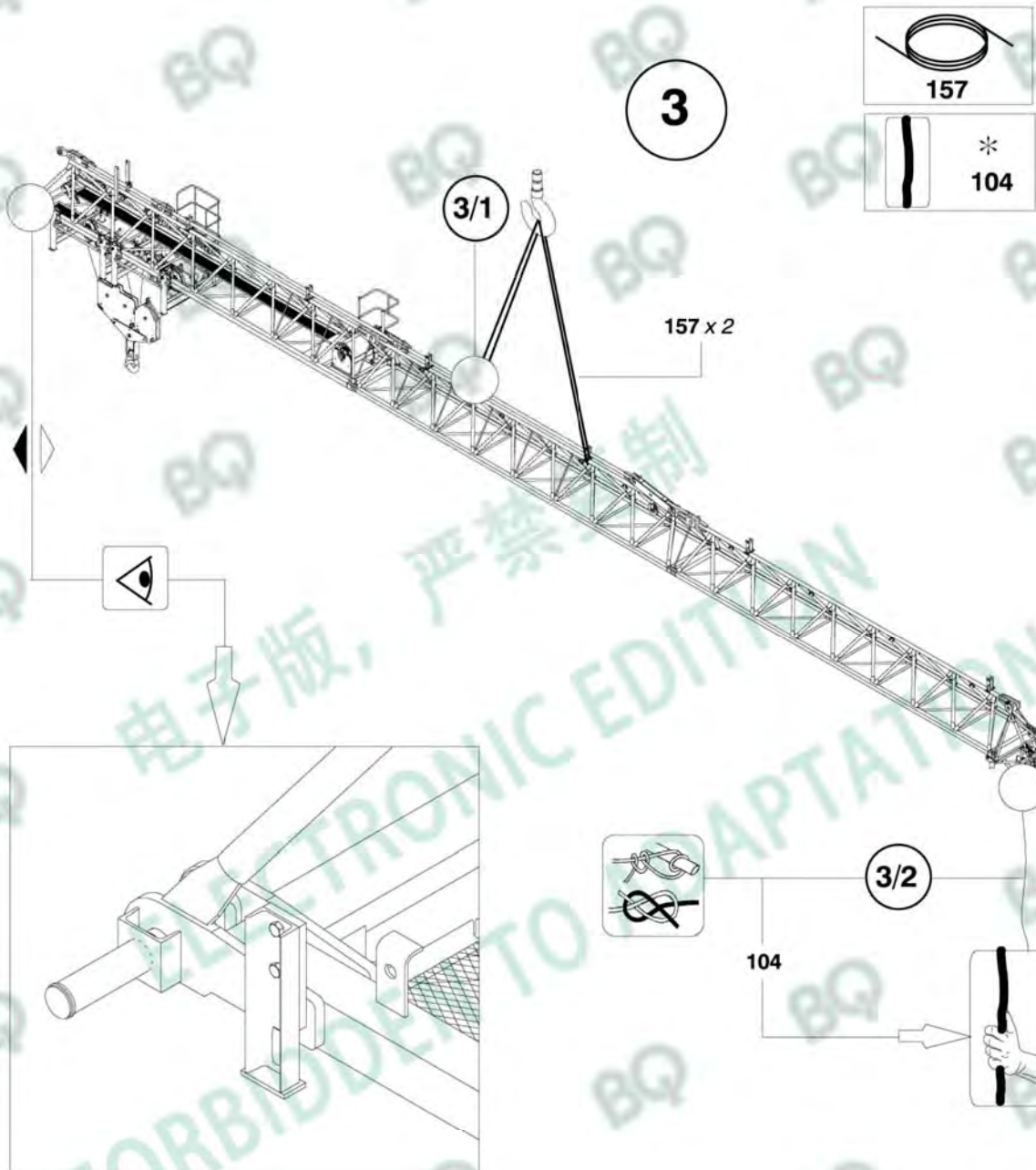


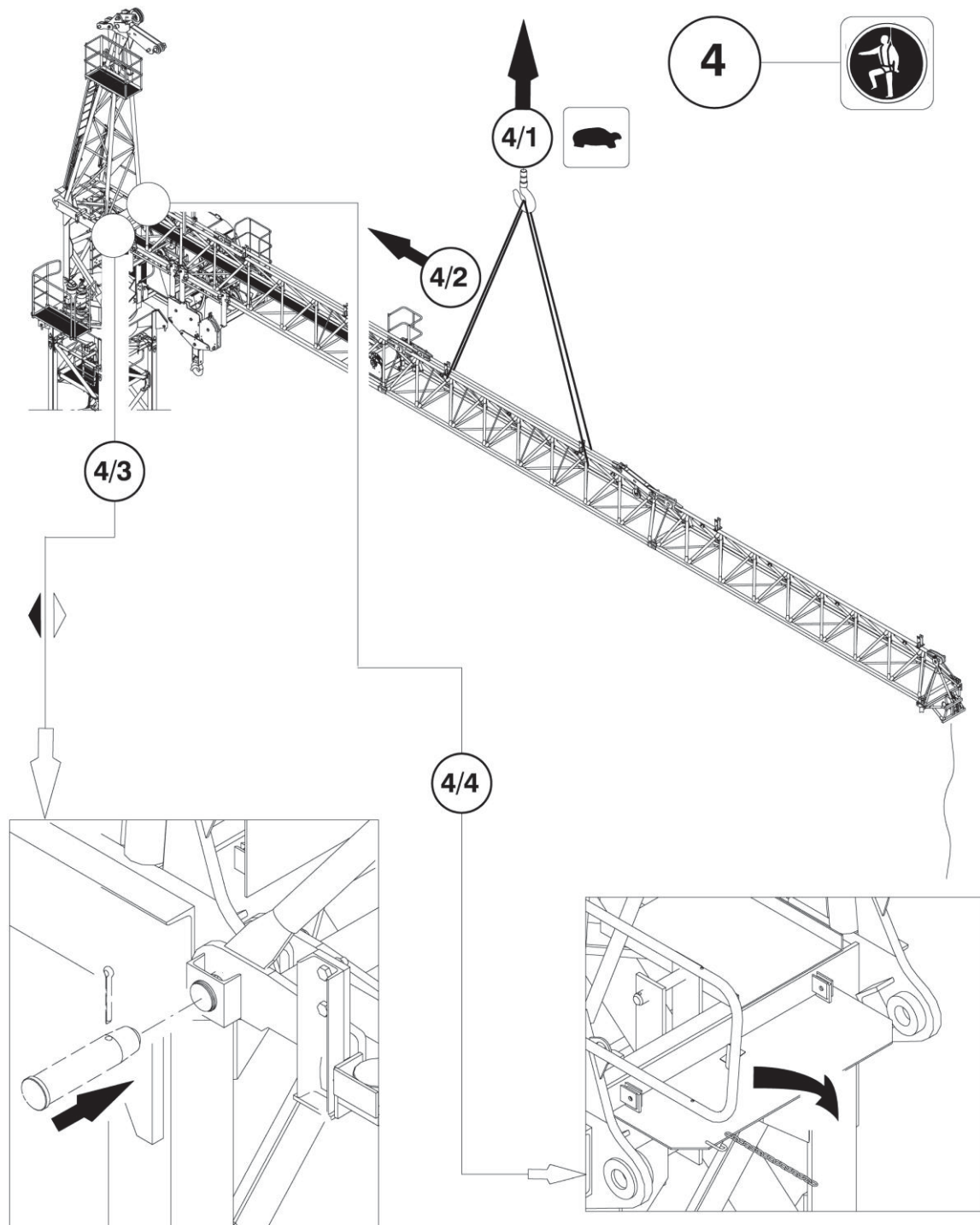
3.3 Hoisting of the Jib and Single Pull Rod

Partial ballasts must be provided for some jib lengths.





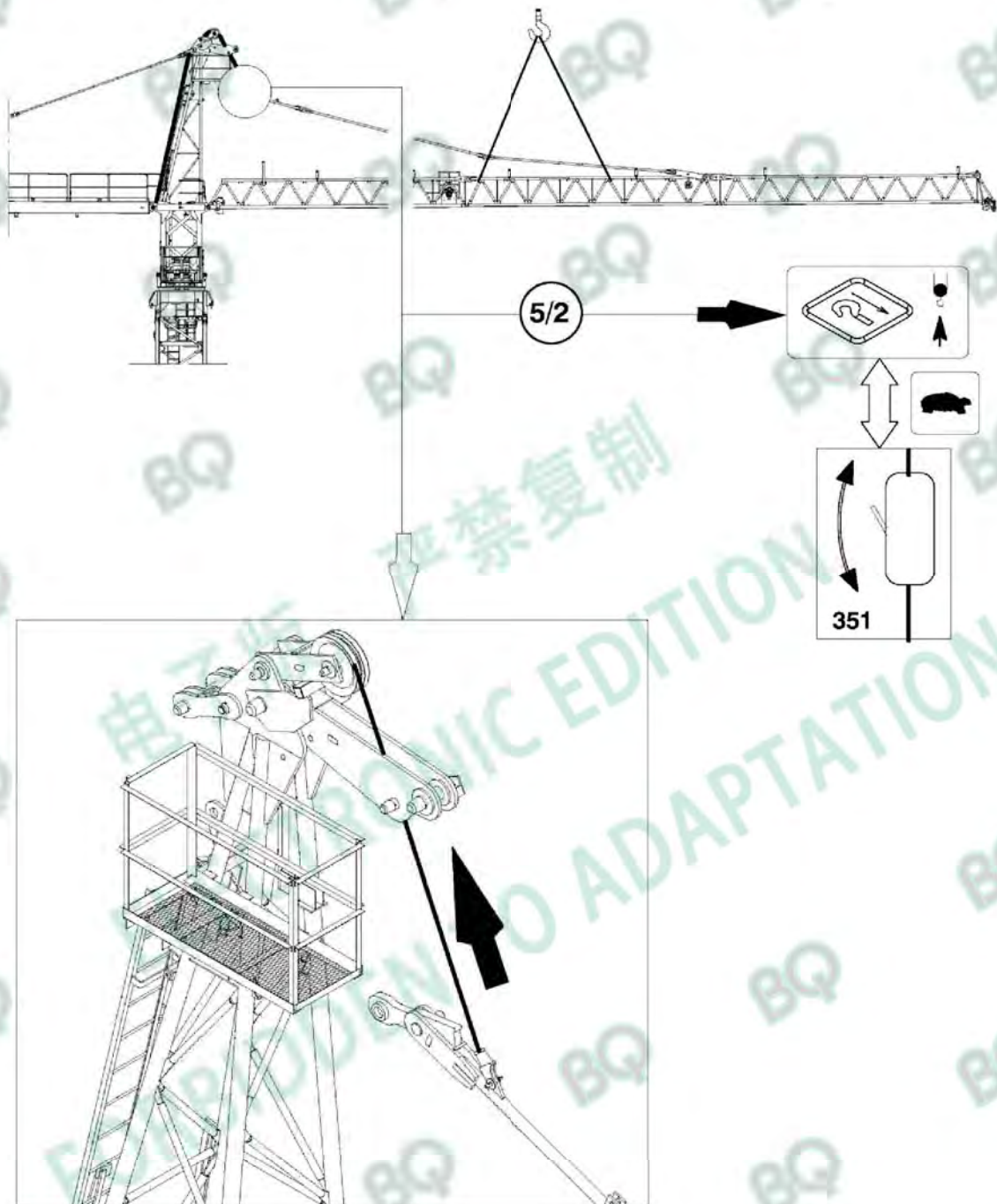


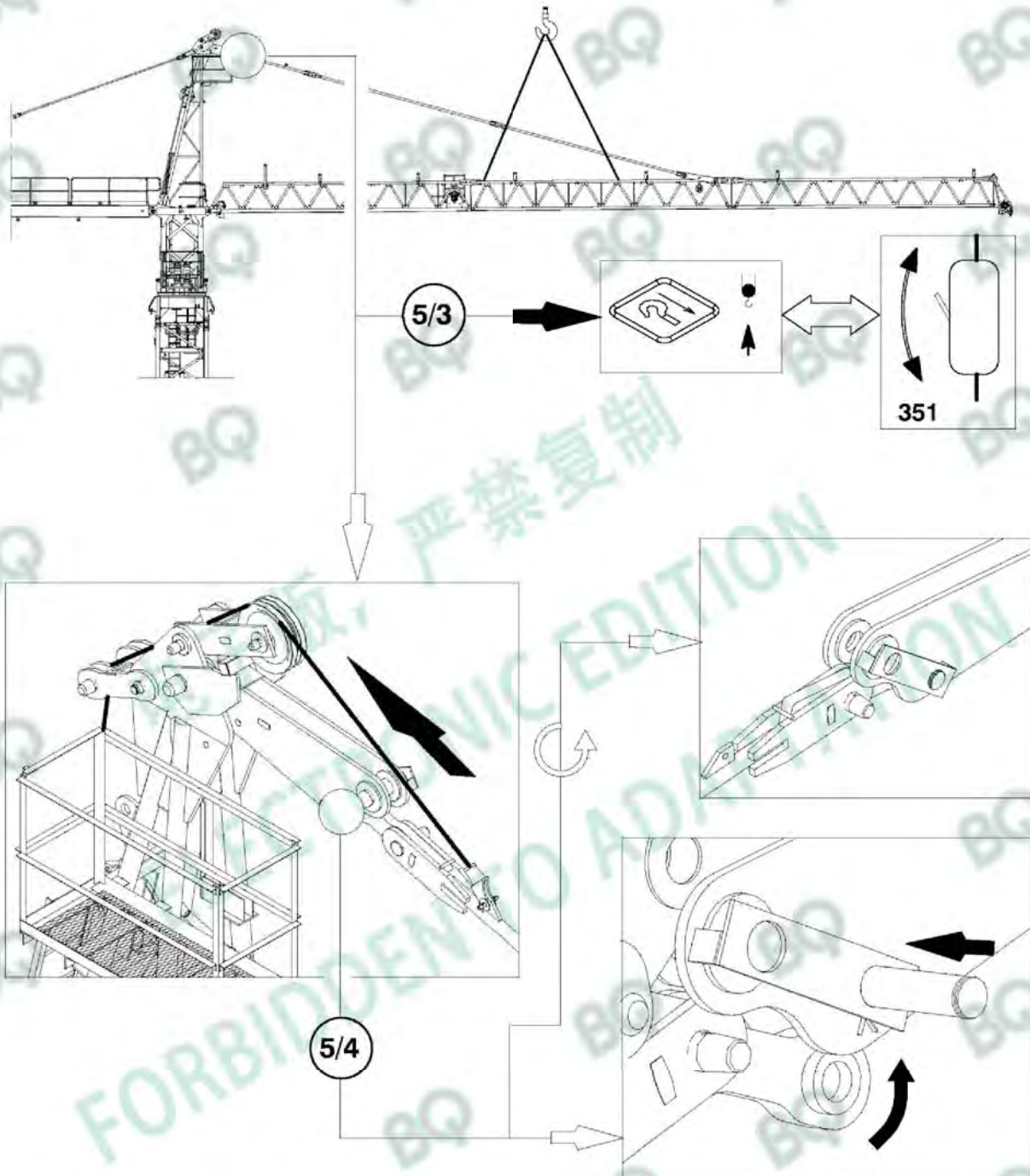


3.4 Fixing the Pull Rod on the Tower Cap with Pins

Note: ropes must be winded tightly and the pull rod system must be fixed by pins.

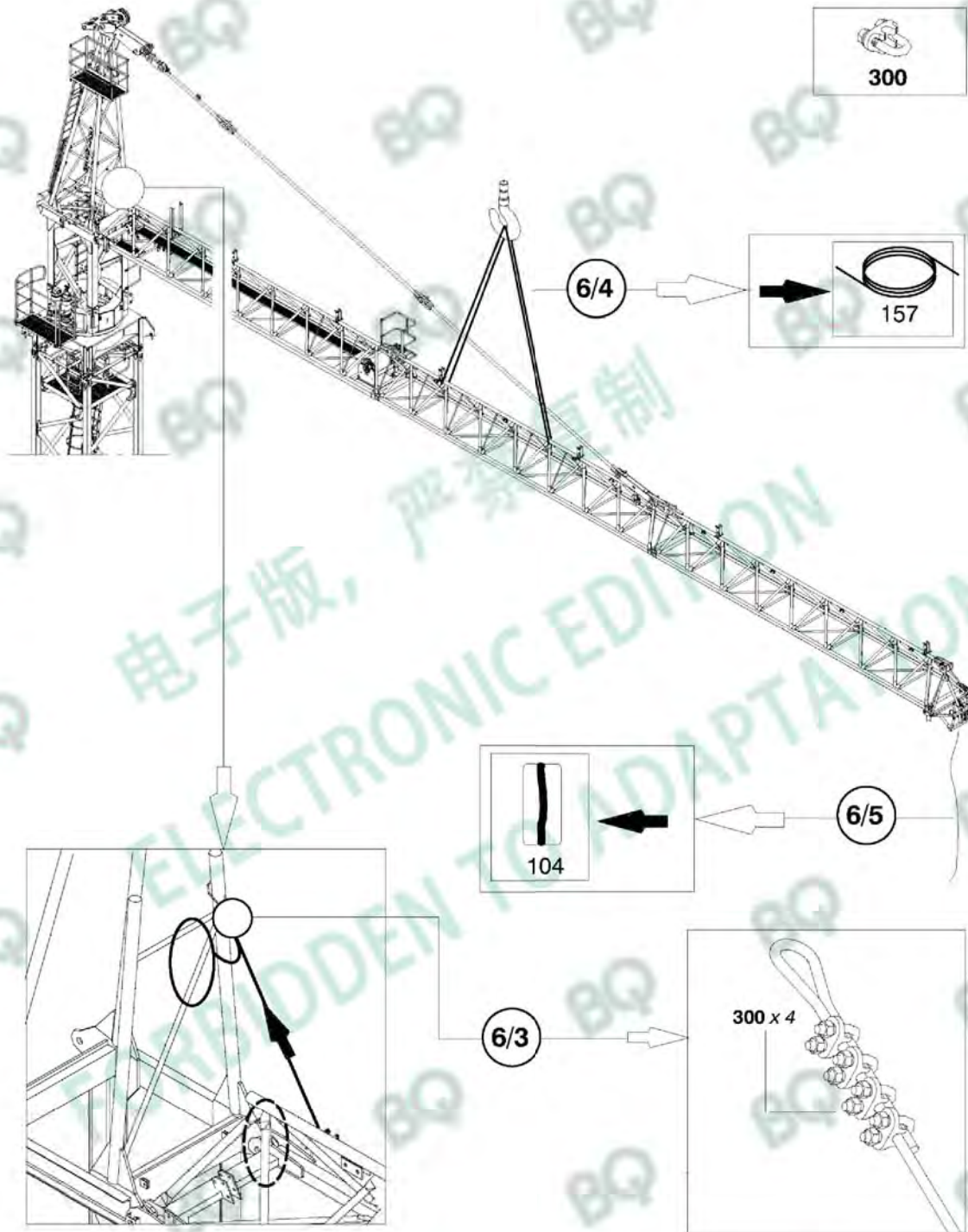








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VIII Installation of Trolley and Pulley Block

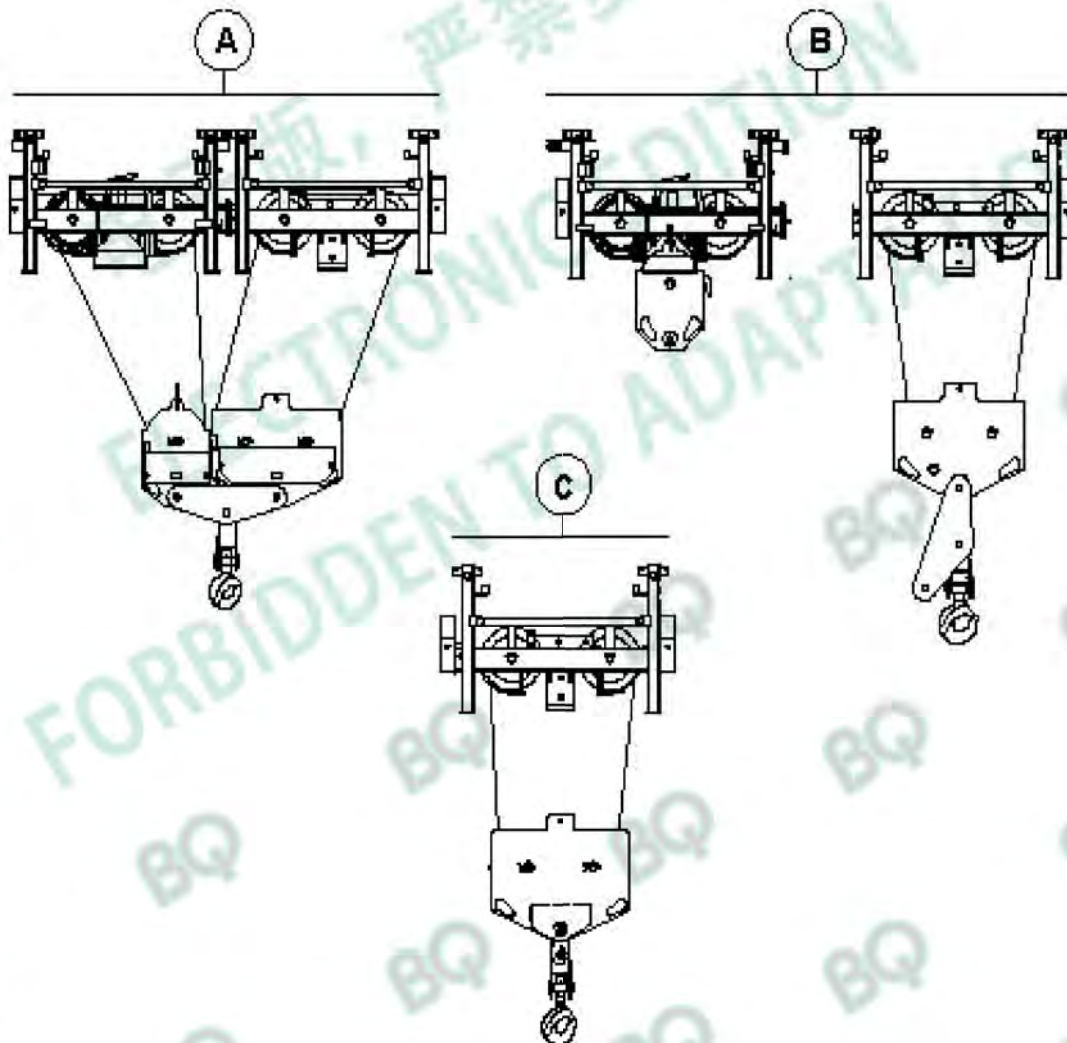
1 General

The tower crane is installed with a double-trolley (2C) or single-trolley (1C) mechanism.

The double trolleys can operate at 4X rate (with two trolley sets and pulley block connected together) (Drawing A) or a single trolley and a pulley block can be combined to operate at 2X rate (Drawing B).

The single trolley can operate at 2X rate (Drawing C).

Note: the double-trolley mechanism can be changed to single-trolley mechanism.

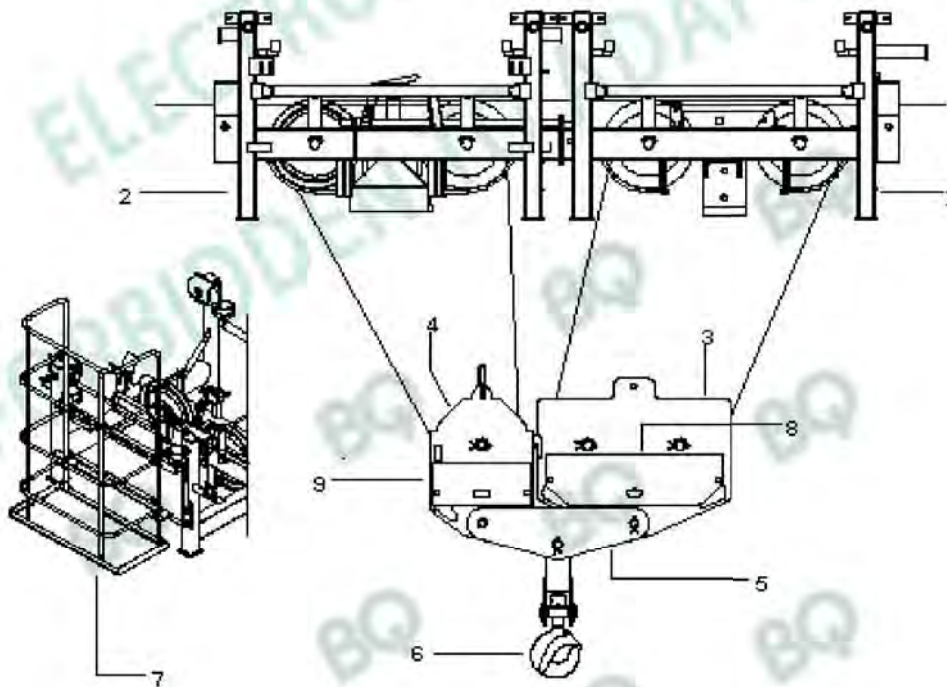


2 Mechanism Composition

2.1 Double-trolley mechanism (2C)

The two trolleys are composed of:

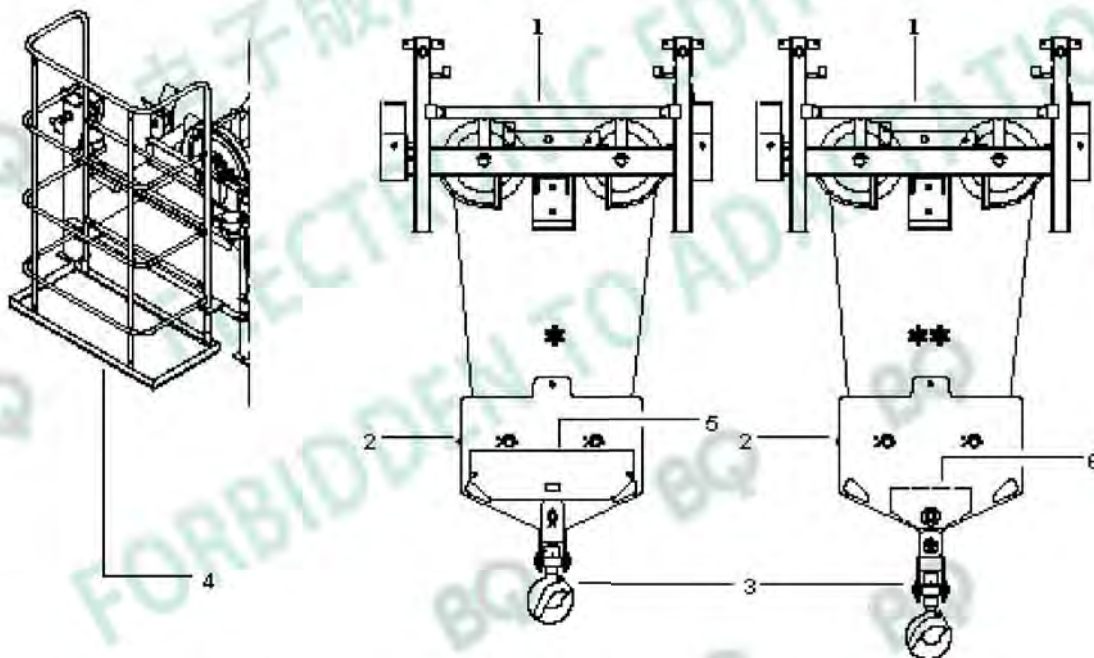
- 1 front trolley (1)
- 1 rear trolley (2)
- 1 front pulley block (3)
- 1 rear pulley block (4)
- A pulley ring (5) with suspension hook (6)
- Trolley platform (7)
- A set of pulley block ballasts operating 70M jib
 - 2 50daN front pulley block ballasts (8)
 - 2 50daN rear pulley block ballasts (9)



2.2 Composition of Single Trolley (1C)

The single trolley is composed of:

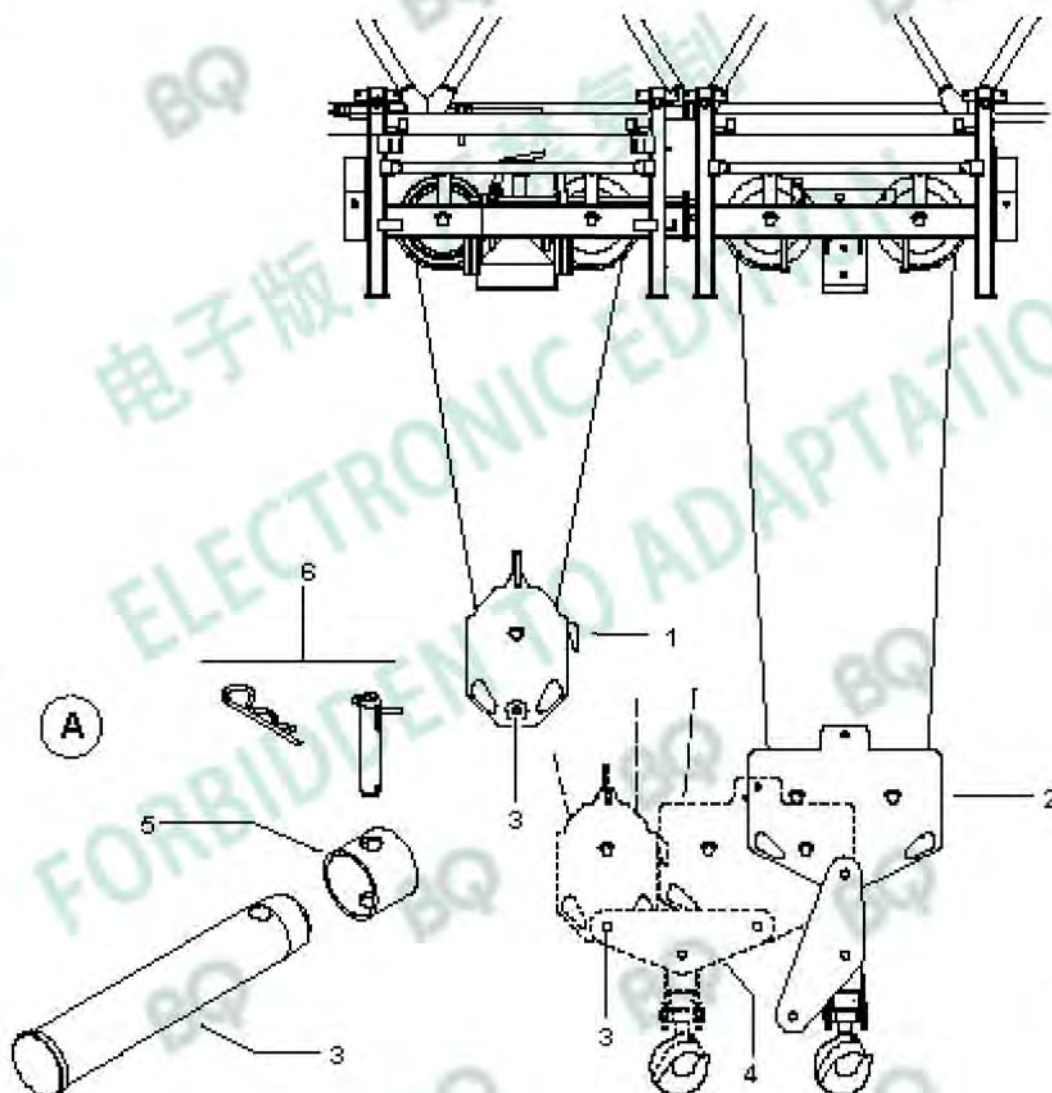
- 1 trolley (1)
- 1 pulley block (2)
- 1 suspension hook (3)
- 1 trolley platform (4)
- A set of pulley block ballasts operating 70M jib
 - 2 50daN front pulley block ballasts (5) (composition of 2C equipment)
 - 1 front pulley block ballast (6)



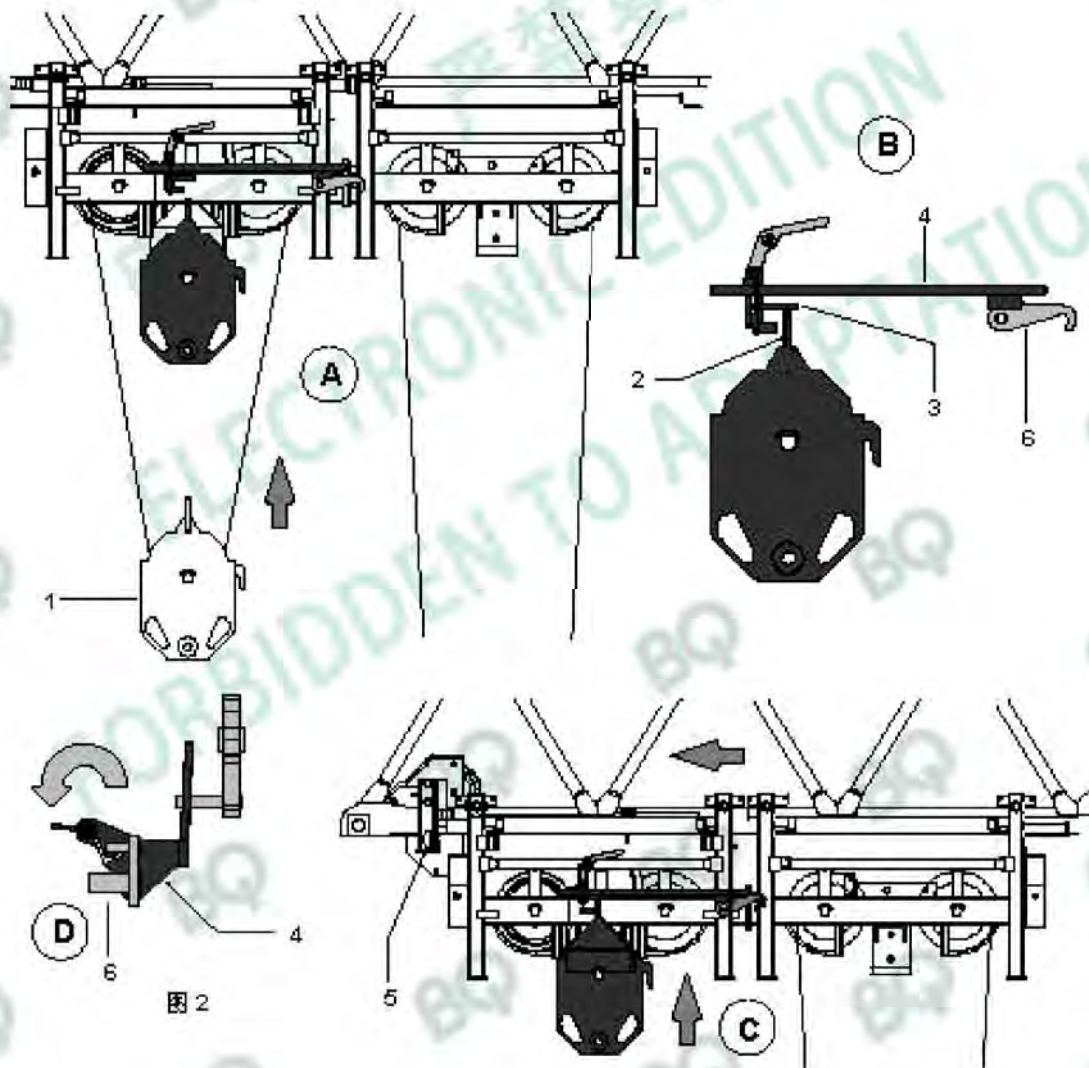
3 Use of Double Trolleys (2C)

3.1 From 4X rate to 2X rate

- Drive the 2 trolleys to the jib root, till the safety device is cut off.
- Lower pulley blocks (1) and (2) to the ground and make them vertical. Pull out shaft pin (3) connecting the connecting plate (4) and rear pulley block (1). Install pins (3), (5) and (6) onto the rear pulley block.



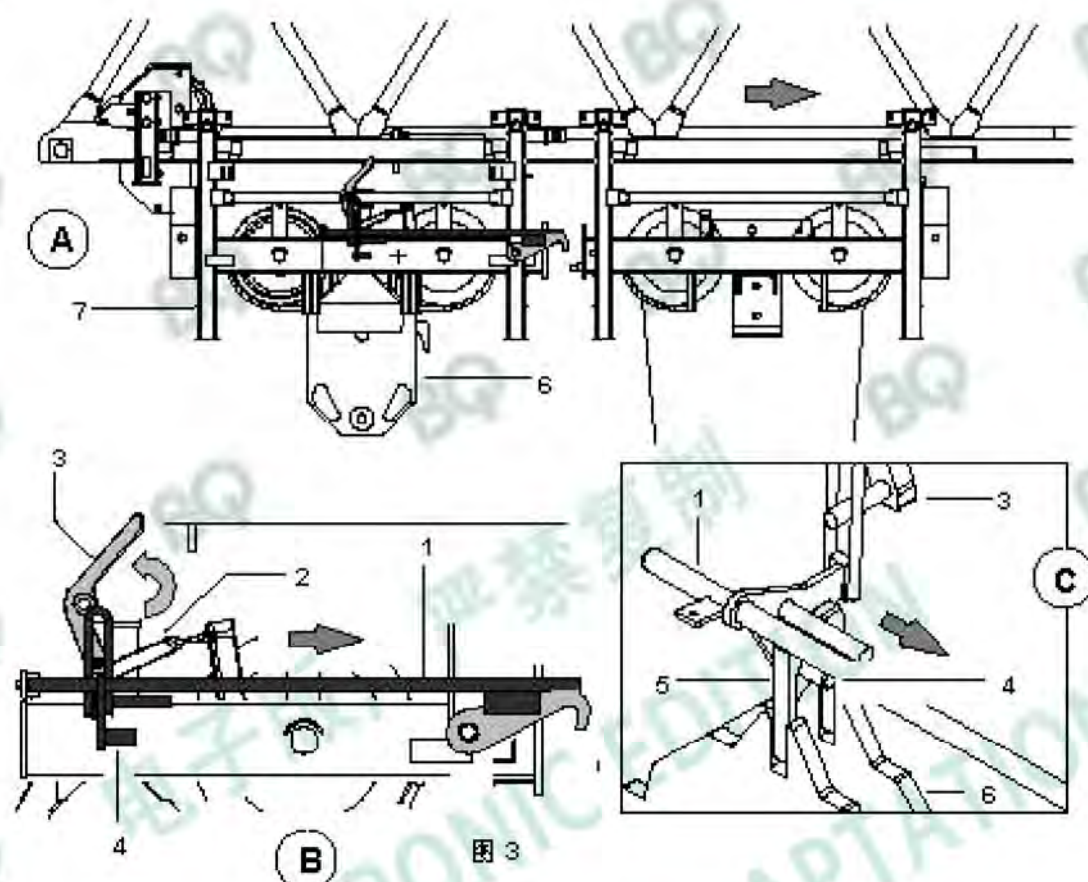
- Carry out "hoisting" operation and rear pulley block (1) leaves the ground, continue the "hoisting", and tappet rod (2) of the rear pulley block gets close to connecting rod (3) of operation shaft (4) (Drawings A and B).
- Press button "shunt" on the control console.
- At the same time, hoist and move the trolley backward to make it stick close to hold-down plate (5) at the jib root and make pulley block (1) stick below the trolley, by doing this: Operating shaft (4) rotates to lift connecting rod (6), and the front trolley is separated (Drawings B-C-D).



- Move the trolley forward and this action will loosen operating shaft (1) and make it move forward under the driving force of spring (2) (Drawings A and B).
- When the trolley moves forward
 - Hold-down plate (3) turn to the turn-up device and lock the trolley at the jib root (Drawings A and B).
 - Projection (4) on operating shaft (1) enters into the elliptical hole on tappet rod (5) of the pulley block and lock it onto rear trolley (7) (Drawings C and A).
- At this time, the mechanism operates at 2X rate.
- (See the operation instruction for use condition at 2X rate)

Note: if a single trolley is used for load variation in long term, following operations shall be performed periodically:

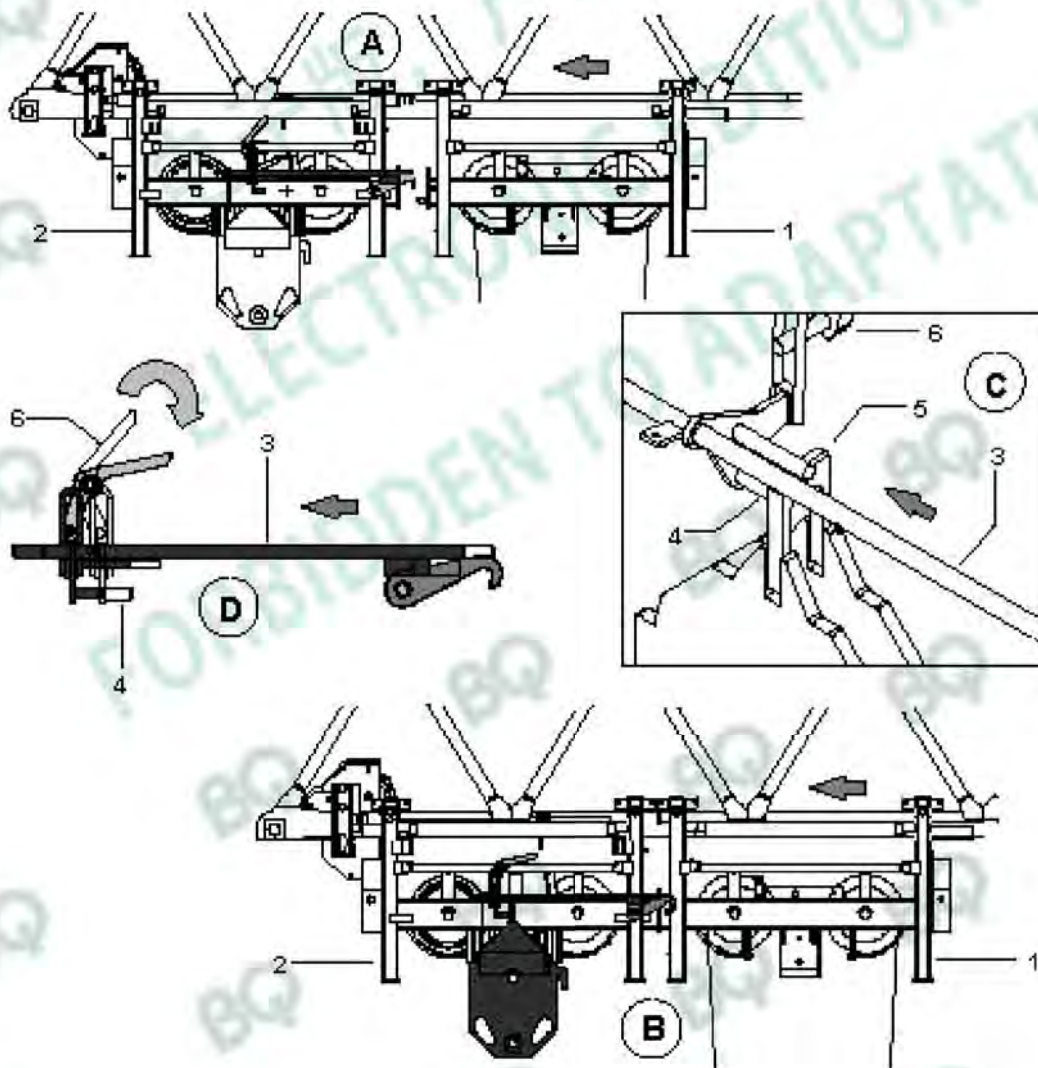
- Recover to 4X rate, carry out several “forward” and “backward” travelling in full length of the jib; meanwhile, carry out “hoisting” and “lowering” action to distribute torsion of the wire rope into the full length. Make sure that wire rope torsionproof device at the jib end rotates flexibly. Recover to 2X rate again.



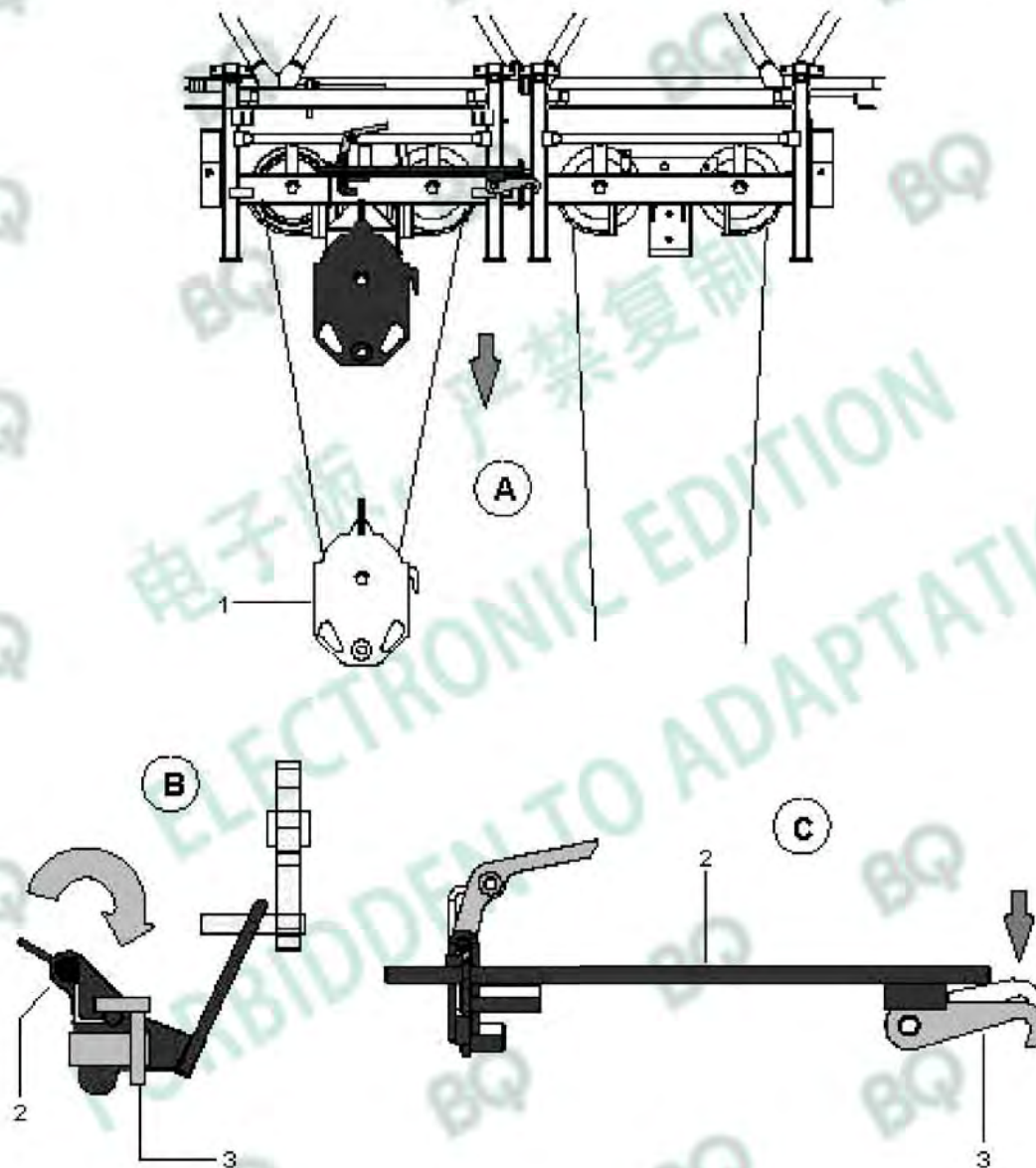
3.2 From 2X rate to 4X rate

- Drive trolley (1) to side of rear trolley (2) at the jib end (Drawing A).
- Lower the front pulley block onto the ground and place it onto a cushion block vertically.
- Press button “shunt” on the control console; meanwhile:
 - Move the trolley backward to drive it and make it stick close to rear trolley (2) (Drawing B), operating shaft (3) moves backward during this operation.
 - Make projection (4) leave the elliptical hole on tappet rod (5) of the pulley block and loosen the rear pulley block.

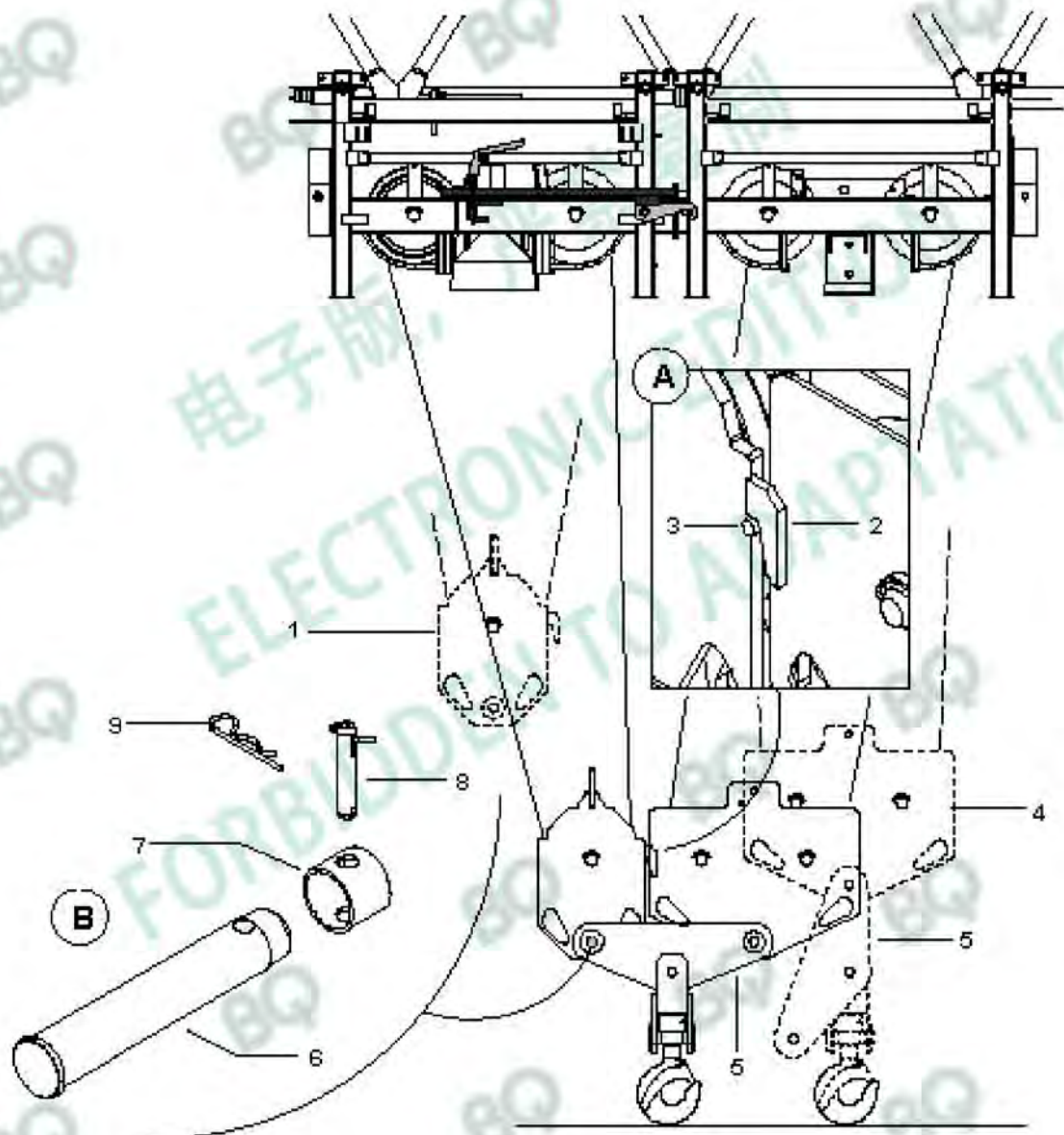
Hold-down plate (6) turns up and loosens the rear trolley (Drawing D).



- Hoist up and down, and the rear pulley block moves down. Operating shaft (2) rotates (Drawings A and B) to drive and lay connecting rod (3) down, then the two trolleys are connected together (Drawings A and B).



- Continue to hoist up and down, and the rear pulley block moves down.
- When rear pulley block (1) touches the ground, connect suspension hook (2) of rear pulley block (1) onto connecting rod (3) of front pulley block (4). (Drawing A).
- Use shaft pin (6) and ring (7) to connect connecting plate (5) onto rear pulley block (1), and fix it with pin (8) and cotter pin (9) (Drawing B).
- The mechanism operates at 4X rate.

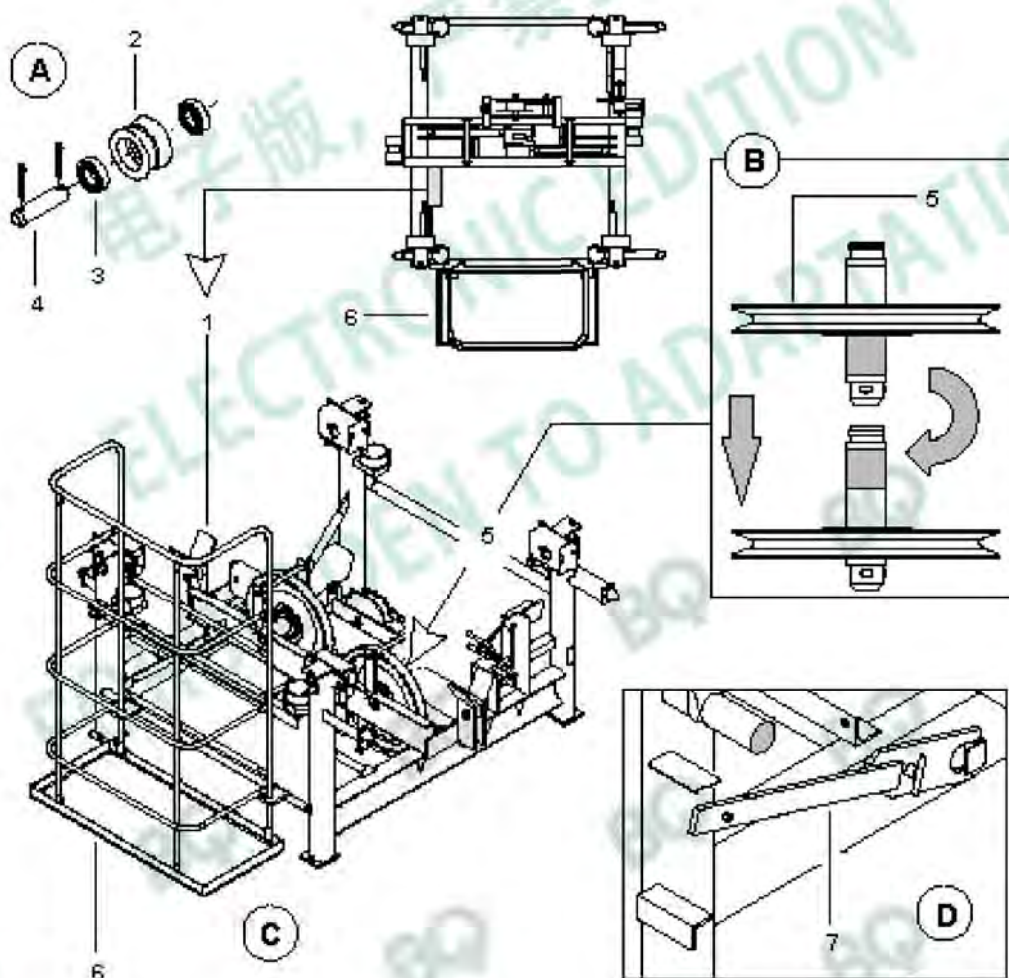


4 From Double-Trolley Mechanism to Single-Trolley Mechanism

The switch from double-trolley mechanism to single-trolley mechanism shall be carried out preferentially before re-installation of the tower crane.

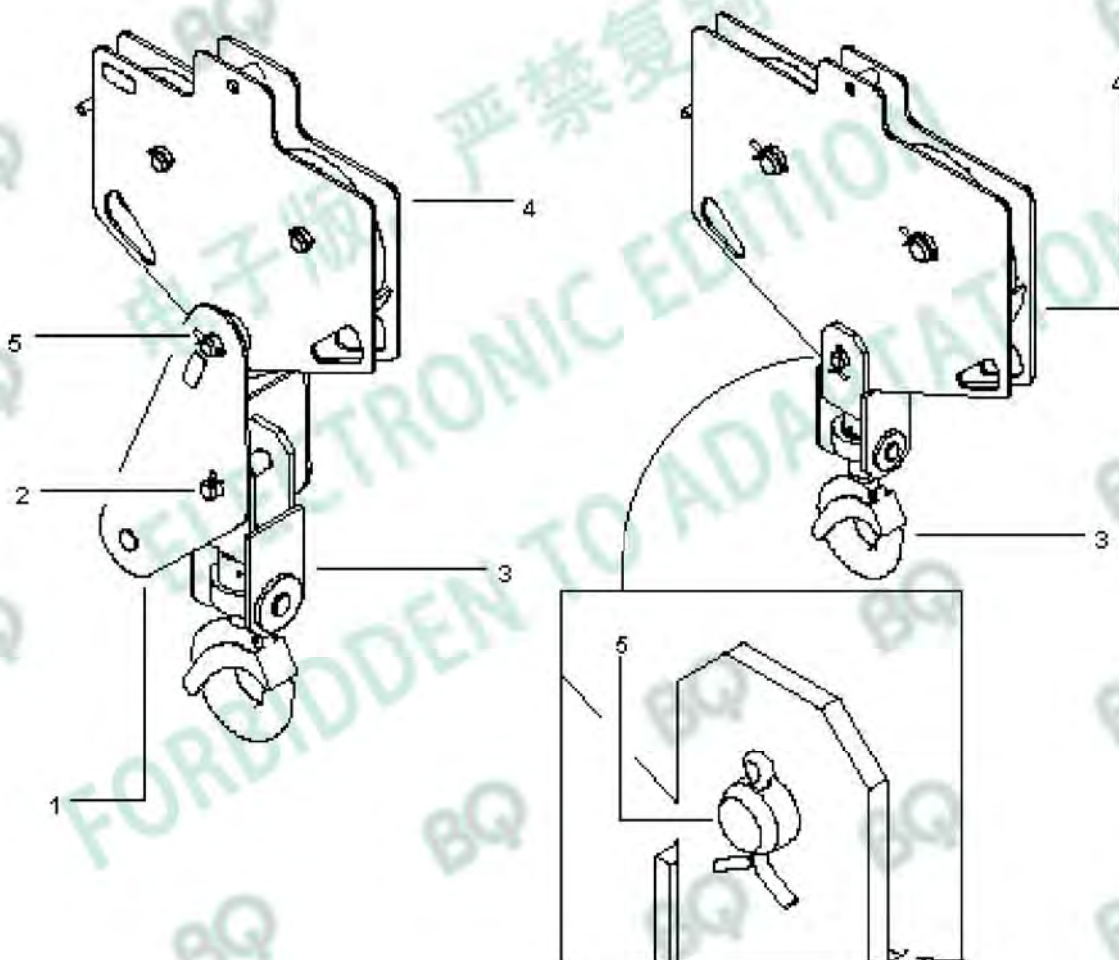
4.1 Trolley Installation

- Use bolts to screw up support (1) in rear part of the front trolley, remove riding wheel (2), spacer bush (3) and shaft pin (4) from the trolley, and then re-install them onto support (1).
- Move front trolley (5) to proper position (Drawing B).



4.2 Installation of Pulley Block

- Pull out shaft pin (2) from connecting plate (1), remove suspension hook (3), pull out shaft pin (2) from pulley block (4) and take out 2 space bushes (6).
- Re-install suspension hook (3) onto pulley block (4) with shaft pin (5) and space bushes (6), and fix with cotter pins. - Store parts out of use in wind and rain shelter.



5 From Single Trolley to Double Trolleys

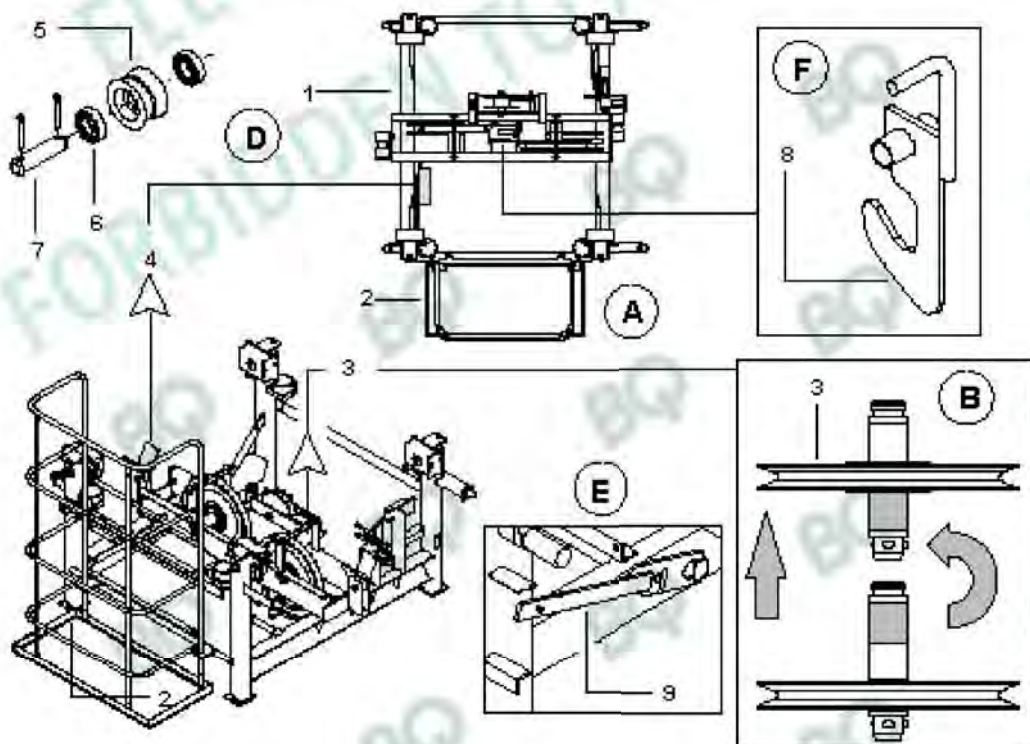
The switch from single-trolley mechanism to double-trolley mechanism shall be carried out preferentially before re-installation of the tower crane.

There are two possibilities:

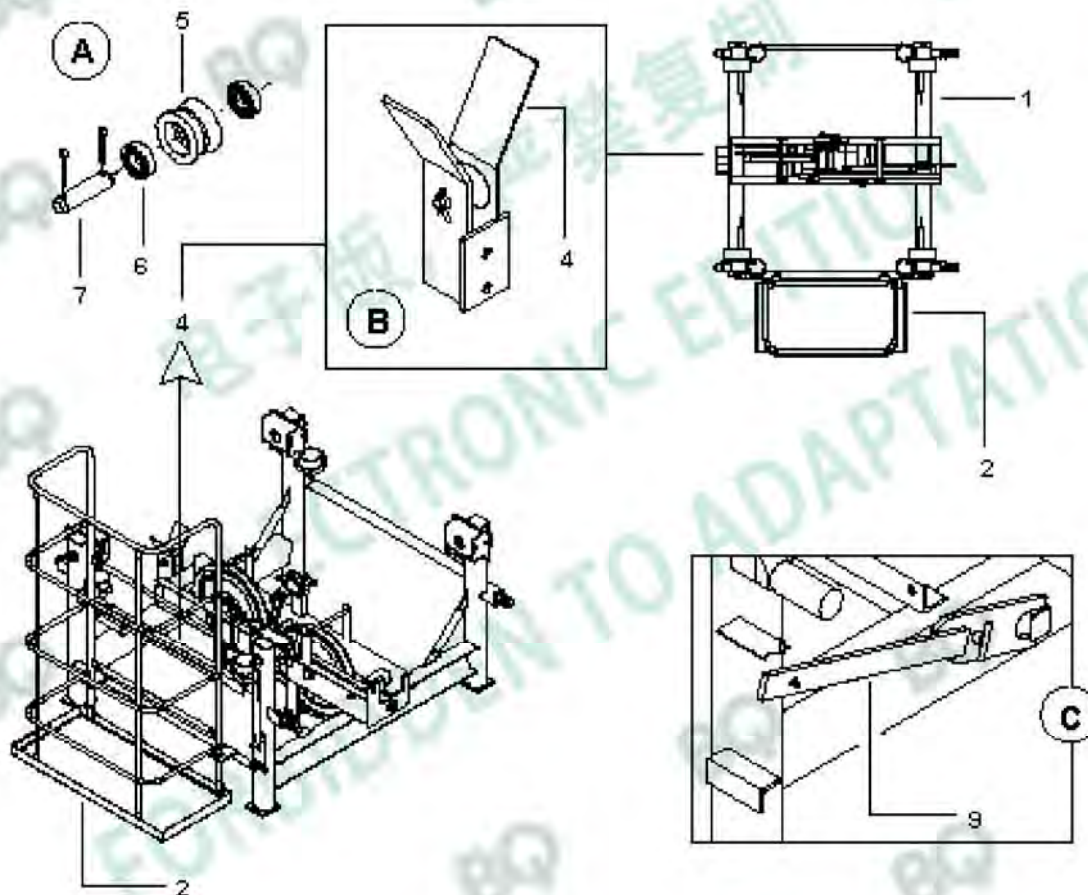
- If operation status of the single trolley is converted from that of double trolleys, just operate in sequence contrary to relevant sections above.
- If the initial status is single trolley operation, then change to the parts of double trolleys converted and operate as below:

From the existing trolley (1) (change the trolley to front trolley in double-trolley mechanism):

- Remove cradle (2) (Drawing B);
- Move front pulley (3) at left (Drawing B).
- Remove riding wheel (5), spacer bush (6) and shaft pin (7) from riding wheel support (4). Remove support (4) and install it at storage position (Drawing C).
- Install connecting rod (8) onto the trolley and remove control handle (9) (Drawings E and F).

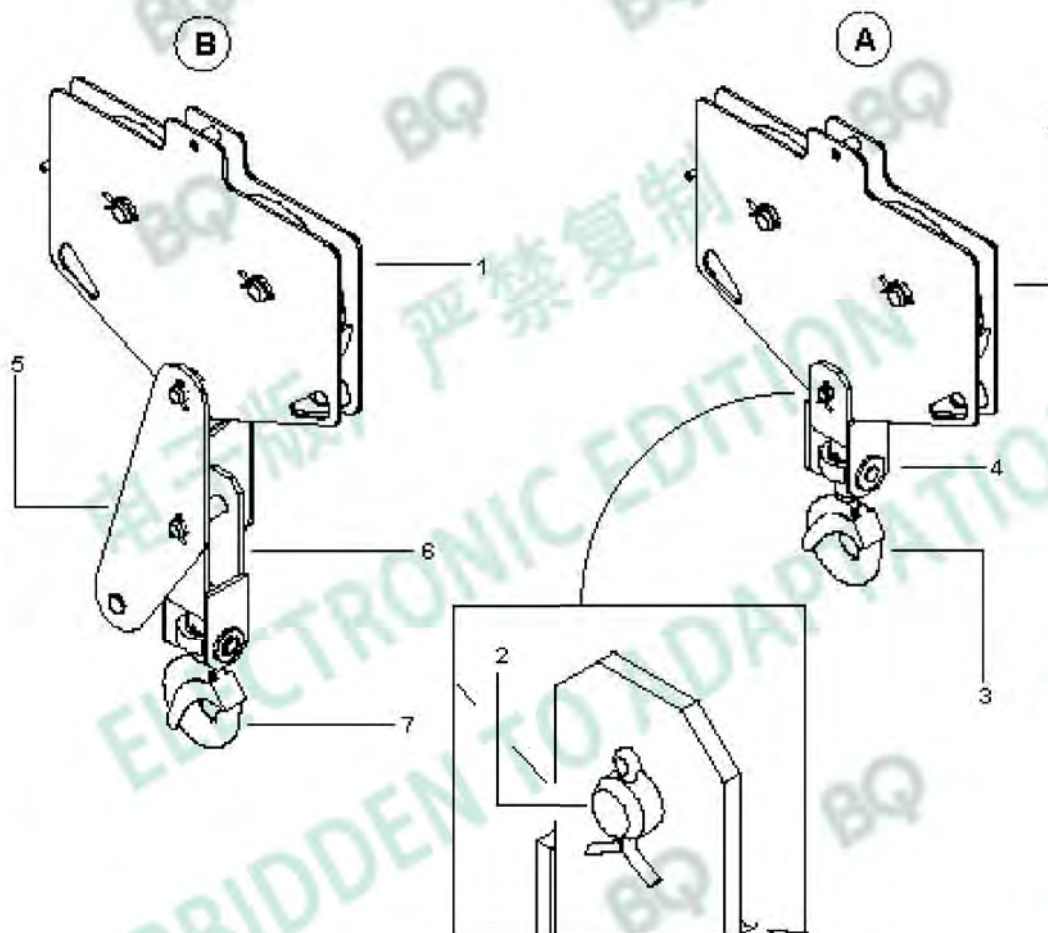


- Install cradle (2) onto the trolley provided (the double-trolley mechanism will become the rear trolley).
- Reinstall riding wheel support (4), riding wheel (5), space bush (6) and shaft pin (7) at the prepared positions and fix the shaft pin with cotter pins (Drawings A and B).
- Reinstall control handle (8) onto the storage position (Drawing C).



From existing pulley block (1) (the double-trolley mechanism will become the front trolley);

- Pull out shaft pin (2), remove suspension (3) and fixing plate (4) (Drawing A);
- Install connecting plate (5) and spacer bush (5), and install fixing plate (7) and suspension hook (8) onto connecting plate (5).



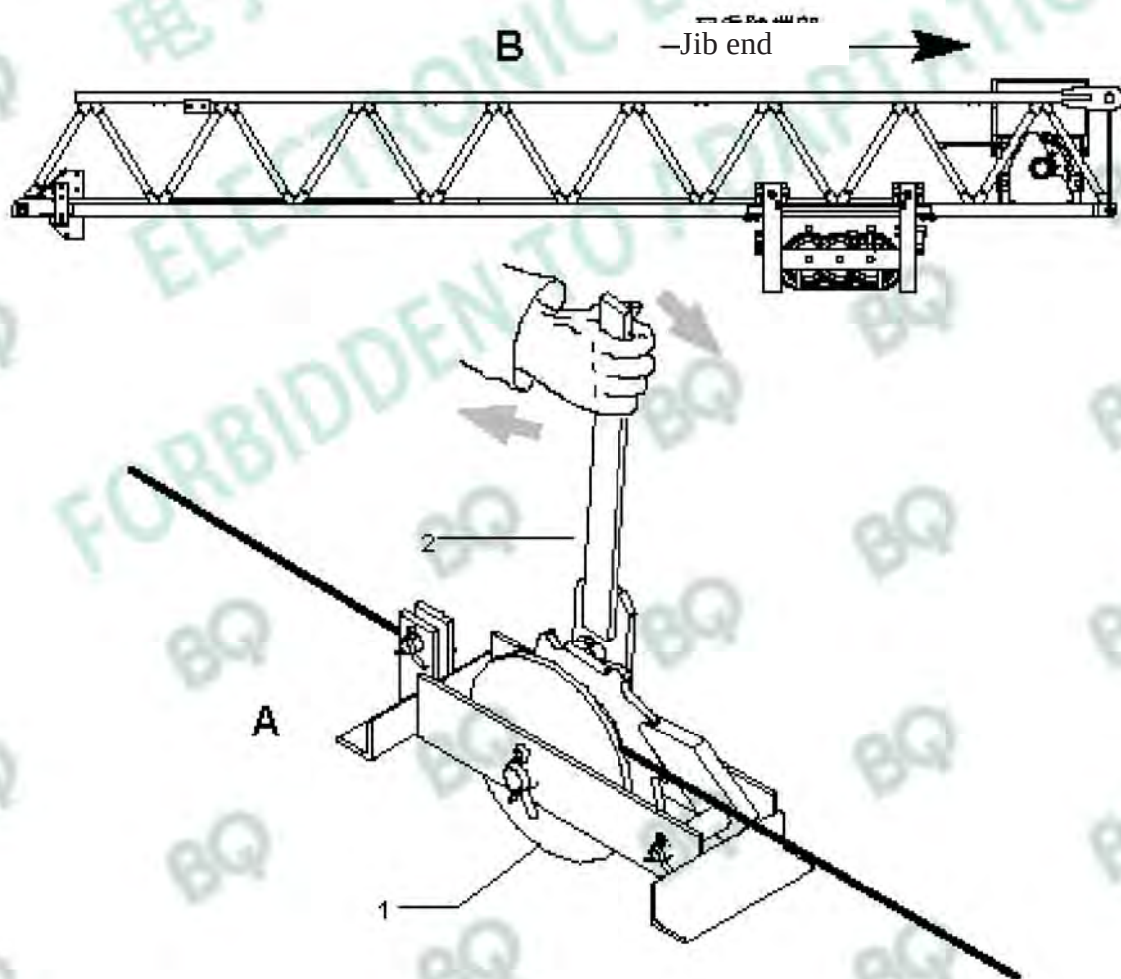
6 Use of Wire Rope

Tension of the travelling wire rope of crane trolley is guaranteed by rope tensioner (1) (Drawing B).

Wire rope tension

- Drive the trolley at the jib root behind the luffing mechanism (Drawing B).
- Operate rope tensioner (1) with handle (2) placed on the trolley and it is only possible to tense travelling wire rope of the front trolley.
- Make the trolley travel back and forth in full length of the jib and distribute the tension onto the front and rear wire ropes.
- Adjust tension of the wire ropes when necessary.

During Disassembly, use handle (2) on the tensioner, loosen it and remove the wire ropes.



7 Parachute Gear

The device can fix trolleys onto the jib when travelling wire rope of the jib trolley breaks.

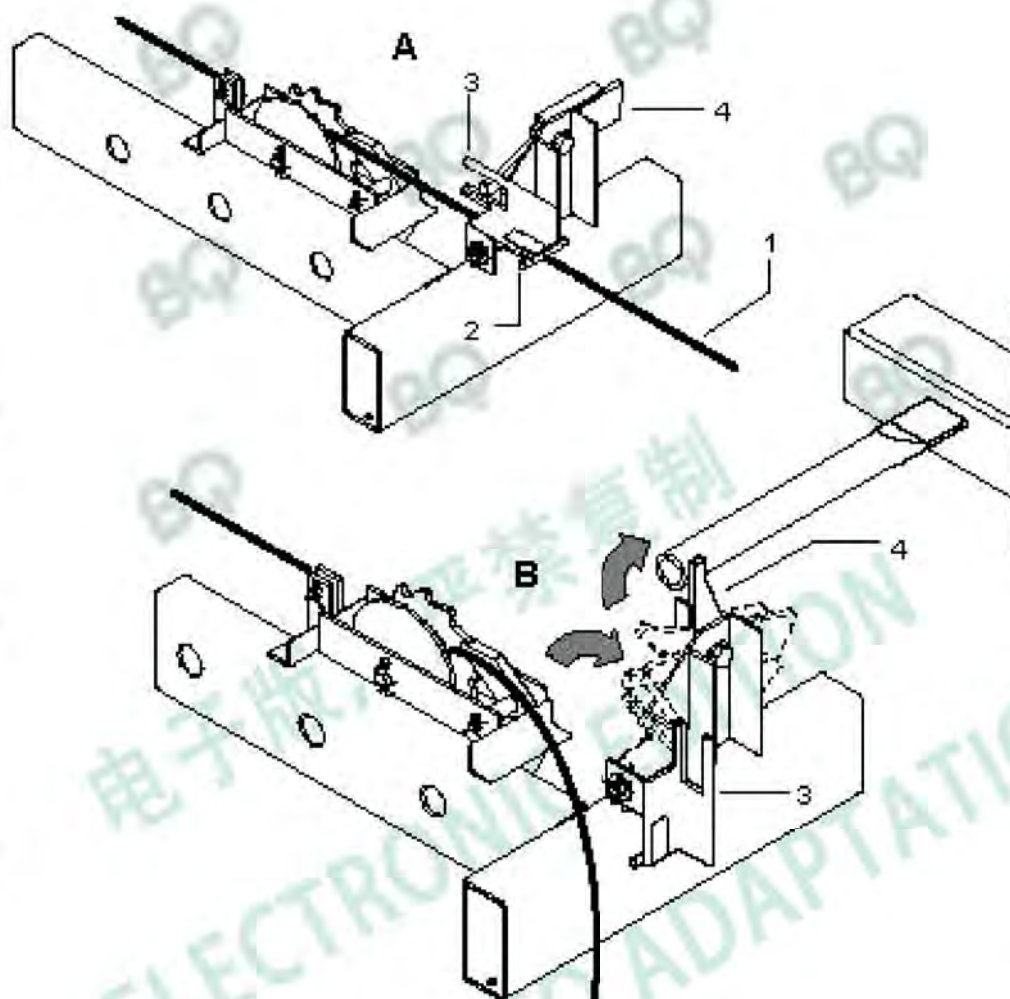
When install the trolley travelling wire rope:

- Check working performance of the parachute gear and lubricate at each position.
- Pass the front trolley wire rope below round bar (2) of transmission mechanism (3) of the parachute gear, make sure that the parachute gear (4) is located in shifting yoke of transmission mechanism (3) (Drawing B).

Operating Principle

When wire ropes are broken transmission mechanism (3) operates to loosen parachute gear (4). The parachute gear lifts up and gets close to the stiffener to fix the trolley onto the jib (Drawing B).

During use, check tension of the wire ropes periodically so as to keep the parachute gear at horizontal position.



8 Trolley Installation

Trolleys shall be installed during jib assembly on the ground.

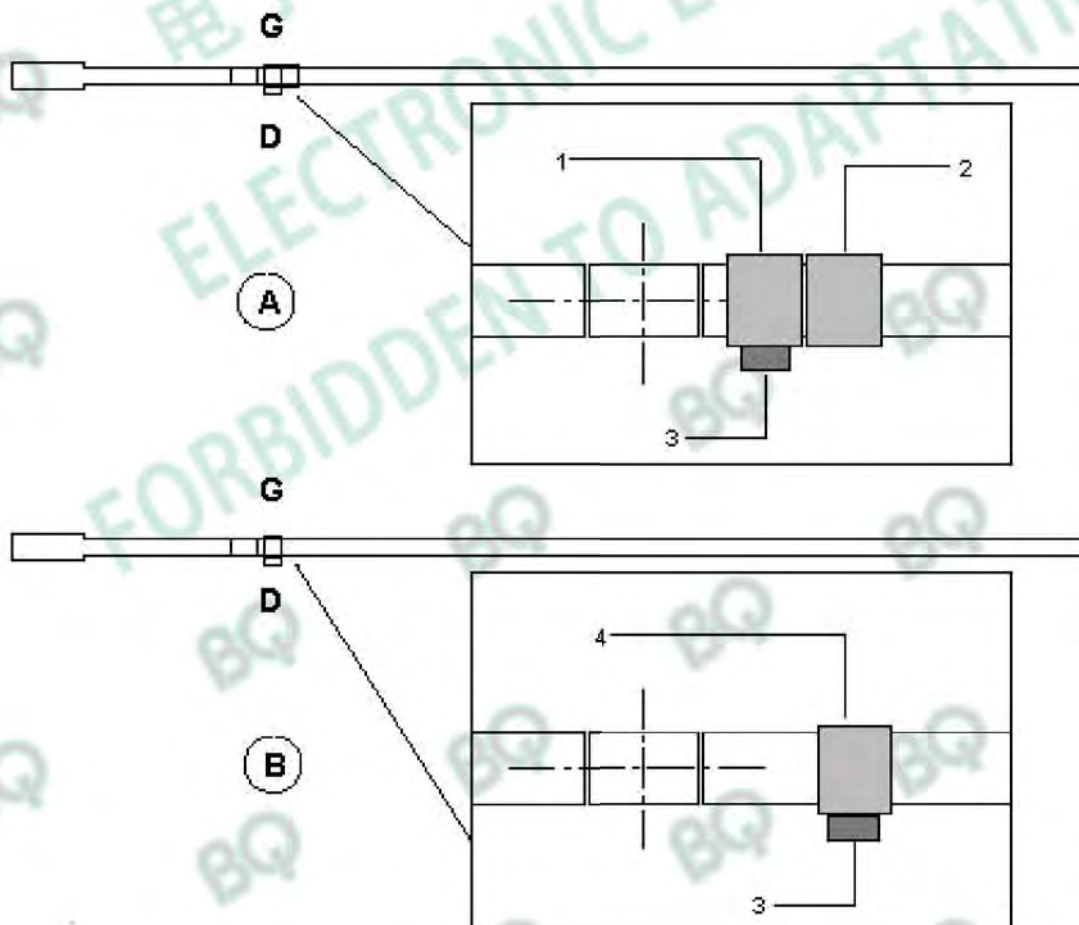
During the following operation, a person shall be located on the jib and check at the jib end (Drawing A).

G =left side D = right side

The trolleys and pulley block are contained into two package units during transportation:

- Rear trolley (1) and front trolley (2) + pulley block and suspension hook.
- Rear trolley platform (3)
- Single trolley (4).

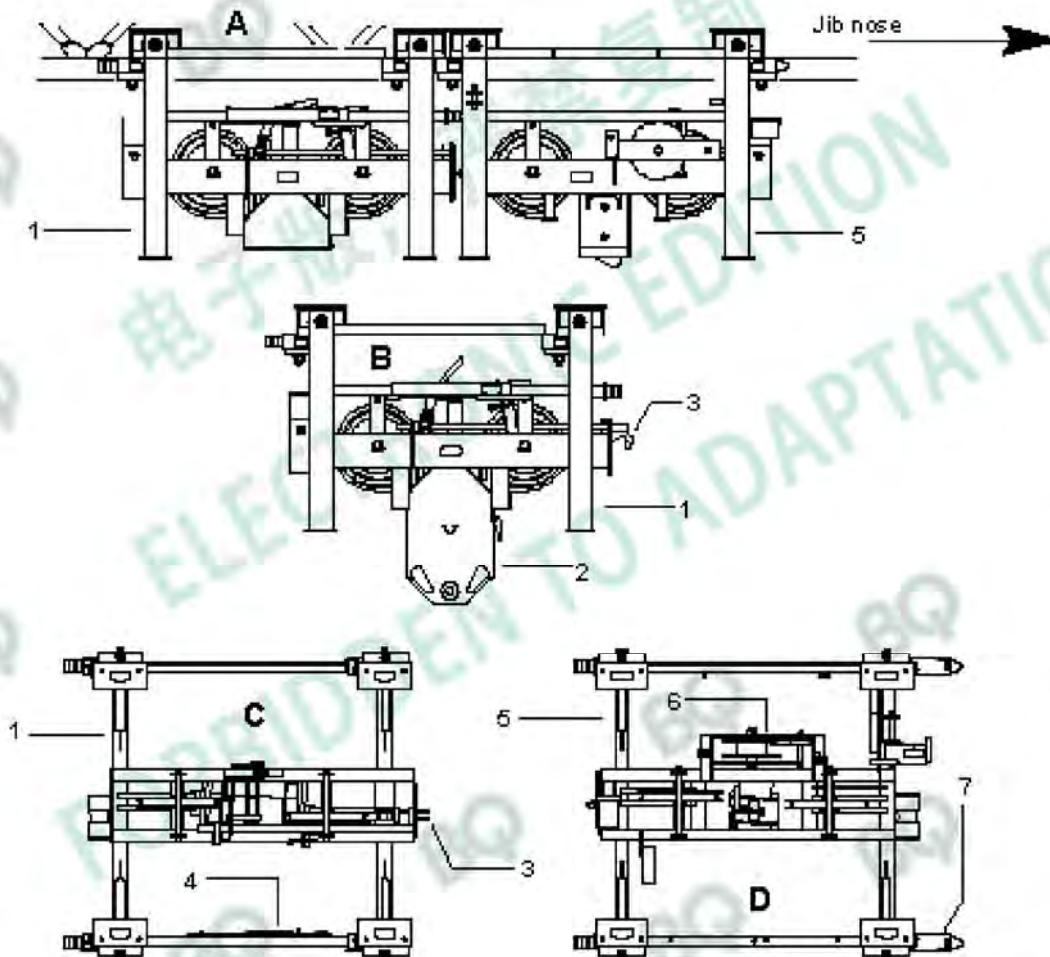
Note: in order to avoid accidents during installation and use, when install the jib and trolleys, use a wire rope to fix the trolleys onto the jib tightly.



8.1 Installation of Double Trolleys on Jib

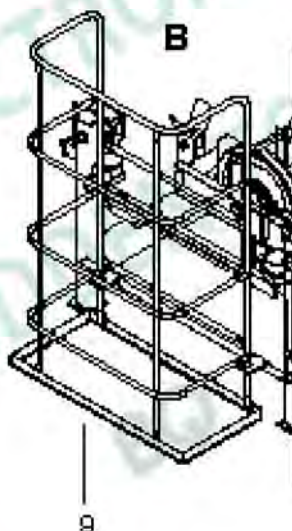
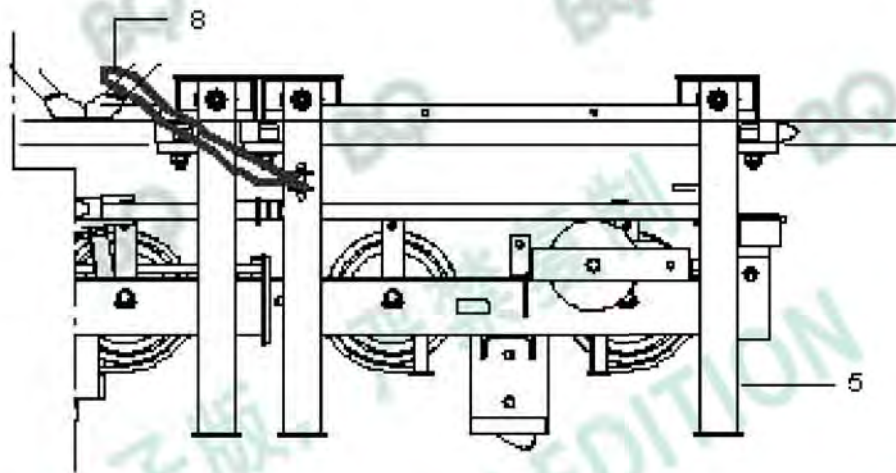
Install the two trolleys onto the jib in the introducing direction (Drawing A). Before put trolley (1) in place, remove pulley block (2) locked by control rod (3) (Drawing B).

- guide in rear trolley (1) and trolley locking control rod (3) from opening at the jib root, and guide in support of control handle (4) from the right side (Drawing C).
- Guide in front trolley (5) and rope tensioner (6) from right side, and guide in hold-down plate (7) from side of the jib end.



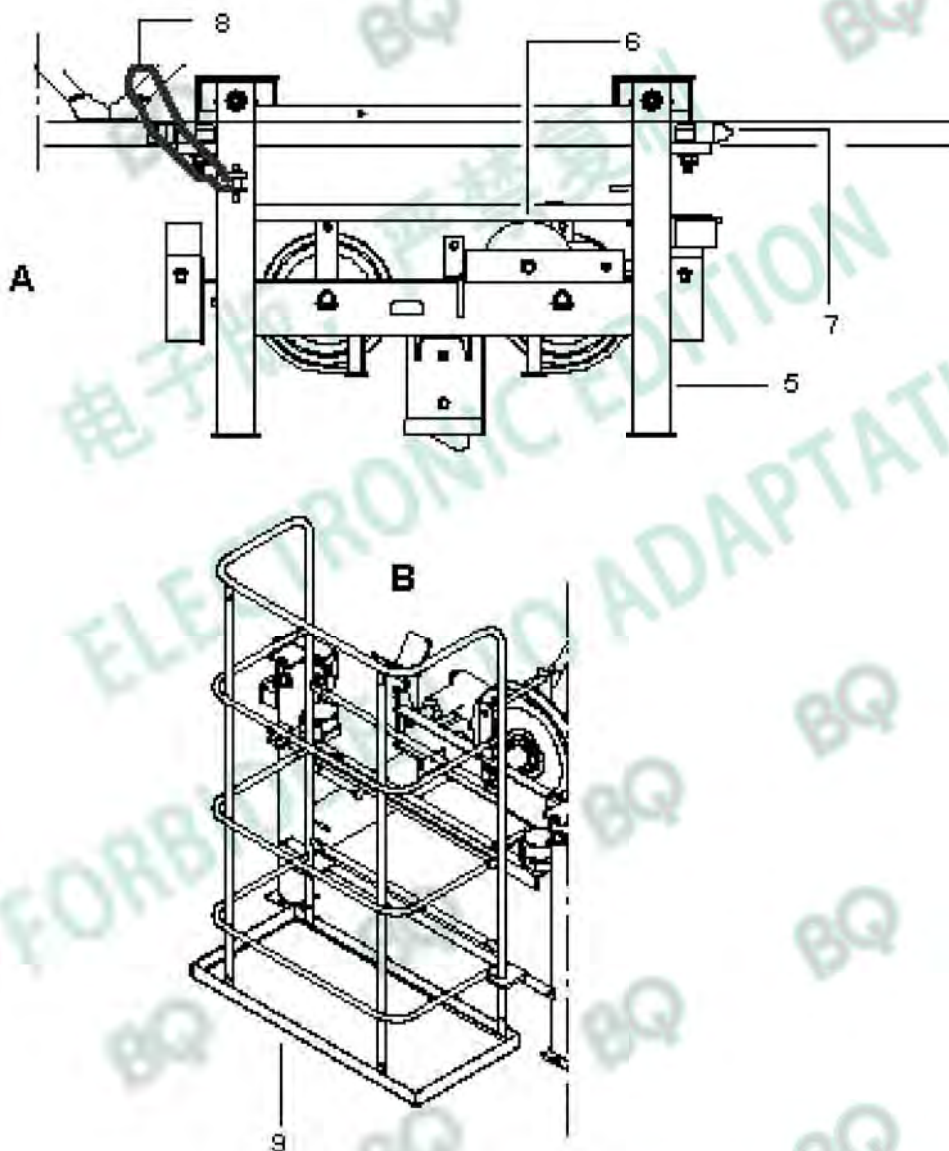
Lock the two trolleys together: drive the two trolleys to the jib root and use rope (8) on front trolley (5) to fix them onto jib (Drawings B).

- Use two bolts M12×35 and two M12 safety nuts to fix cradle (9) onto the rear trolley (Drawing B).



8.2 Installation of Single Trolley on Jib

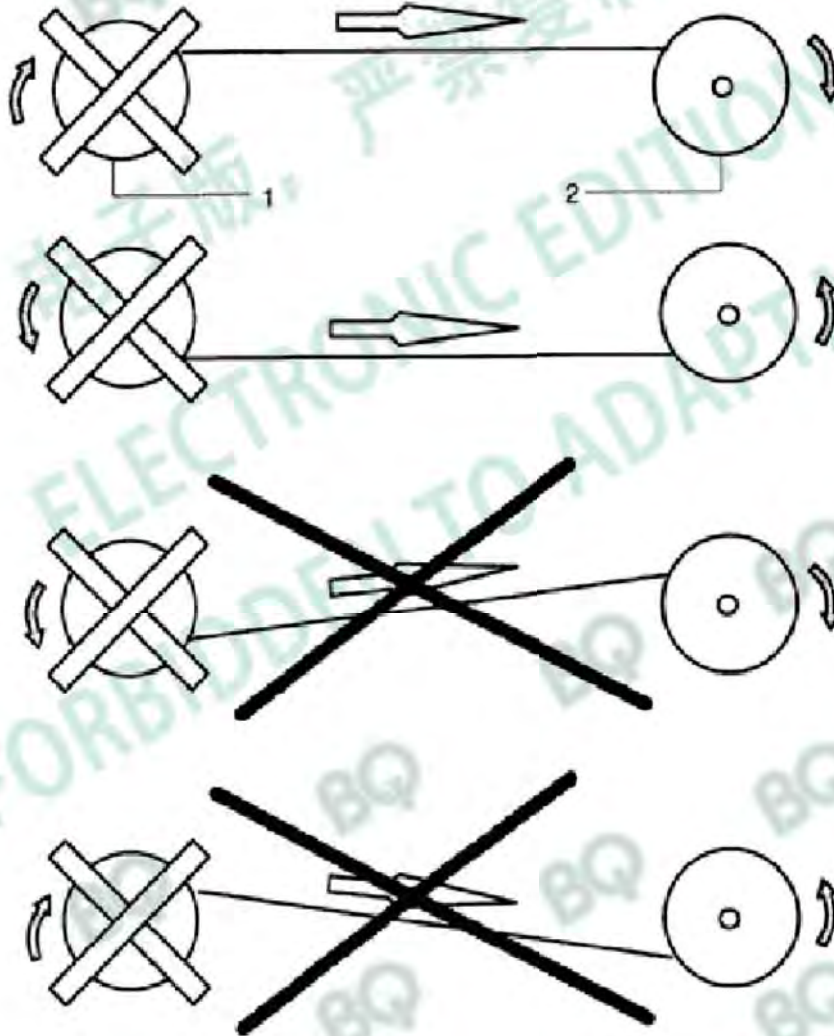
- Guide in front trolley (5) equipped with rope tensioner (6) from the left side, and guide in hold-down plate (7) from side of the jib end.
- Drive the trolley to the jib root and use rope (8) to fix it onto the jib. (Drawing B)
- Use two bolts M12×35 and two M12 safety nuts to fix cradle (9) onto the rear trolley (Drawing B).



IX Wire Rope

9.1 Unwinding of Wire Rope:

- When wind a roll of wire rope (1) onto winding drum (2), in order to avoid change in winding direction of the wire rope, operate as per Drawing 1;
- When operate this step, reserve a large distance as much as possible between winding disc (1) and drum (2).
- When wind the wire rope, pay attention and roll it into rope slot of the drum correctly.



	30m	35m	40m	45m	50m	55m	60m	65m	70m
L	45m	50m	55m	60m	65m	70m	75m	80m	85m
6×19-φ7.7-170 Kg/mm ²									

	30m	35m	40m	45m	50m	55m	60m	65m	70m
L	55m	65m	75m	85m	95m	105m	115m	125m	135m
6×19-φ7.7-170 Kg/mm ²									

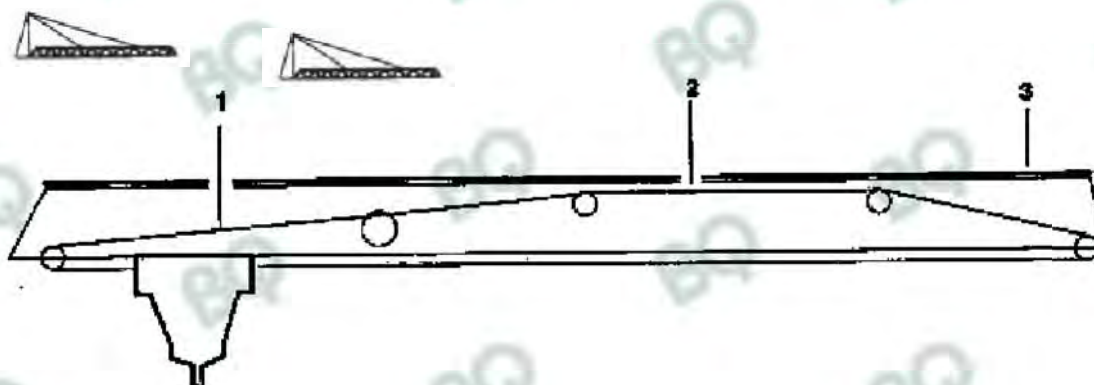
	30m	35m	40m	45m	50m	55m	60m	65m	70m
L	34m	39m	44m	49m	54m	59m	64m	69m	74m
6×19-φ7.7-180 Kg/mm ² 热镀锌									

9.2 Luffing Wire Rope

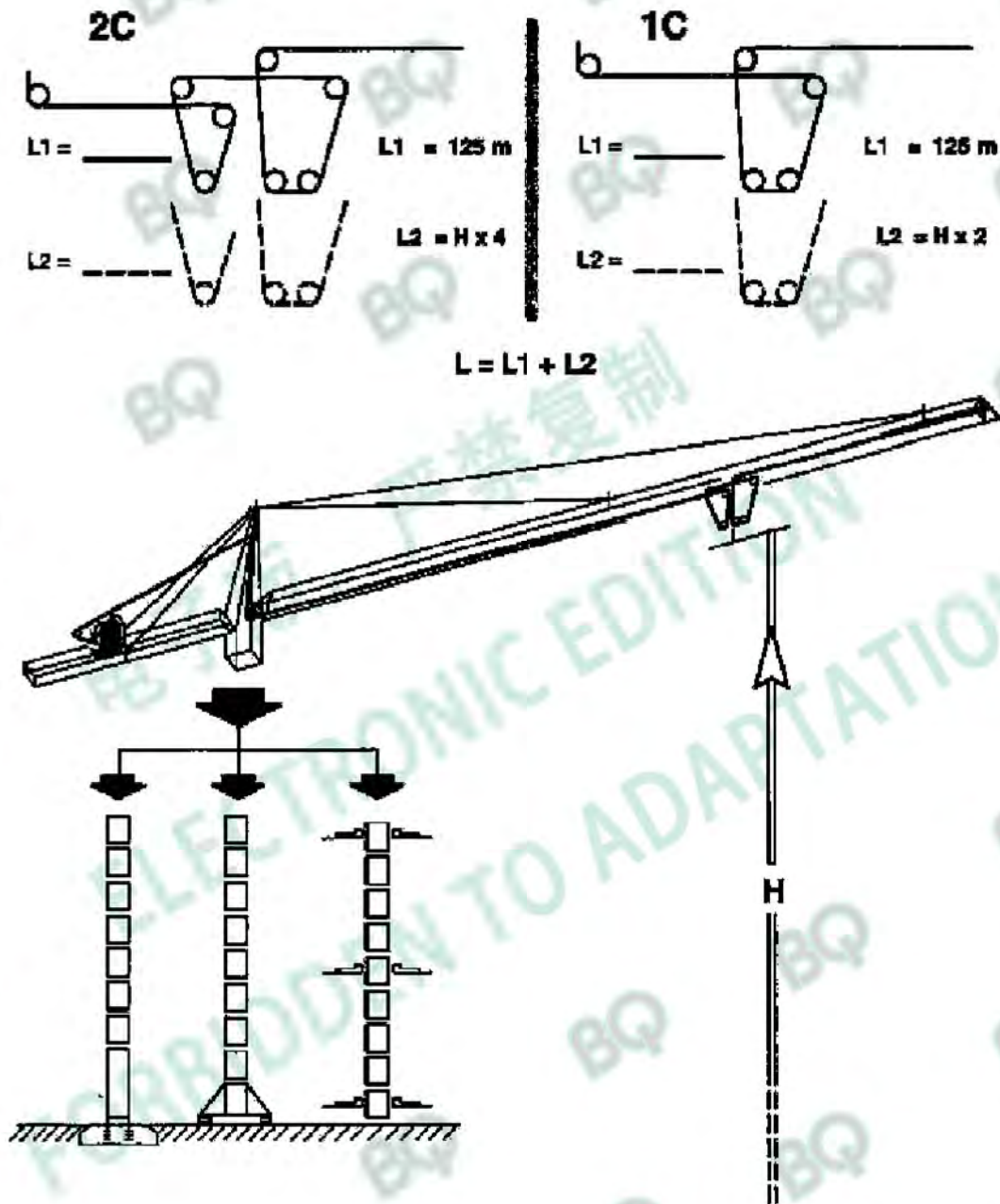
9.2.1 Rear Luffing Wire Rope

Front Luffing Wire Rope

9.3 Jib Wire Rope



9.4 Selection of Hoist Rope (Max. load of 16T)



D20 (35×7—1960 MPa non-rotating rope)

9.5 Unwinding of Wire Rope

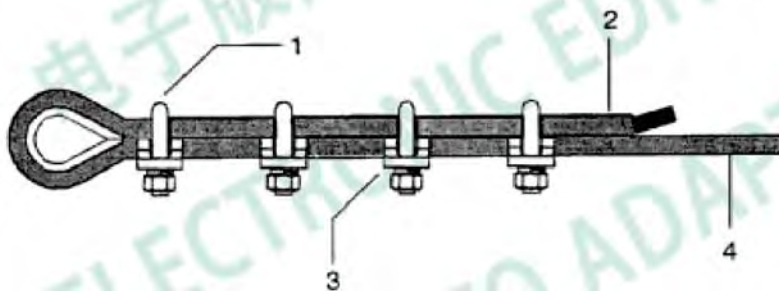
9.5.1 General Rules

When pass and roll wire rope, check condition of the rope. Pay attention and select wire rope in good condition. Conform to uniform length, diameter and characteristics of the wire rope specified; pay attention to rope circles and rope clip positions that shall be reserved.

9.5.1.1 Fore replacement standard of the rope, check and replace it as per the instruction.

9.5.1.2 Assembly of rope clip

The rope clip shall be fastened onto rope tail section (2) by U shaped bolt (1), and clip holder (3) shall be fastened onto operating section (4). (Drawing 1).



The rope clip quantity depends on nominal diameter of the rope.

9.5.2 Unwinding of Trolley Rope

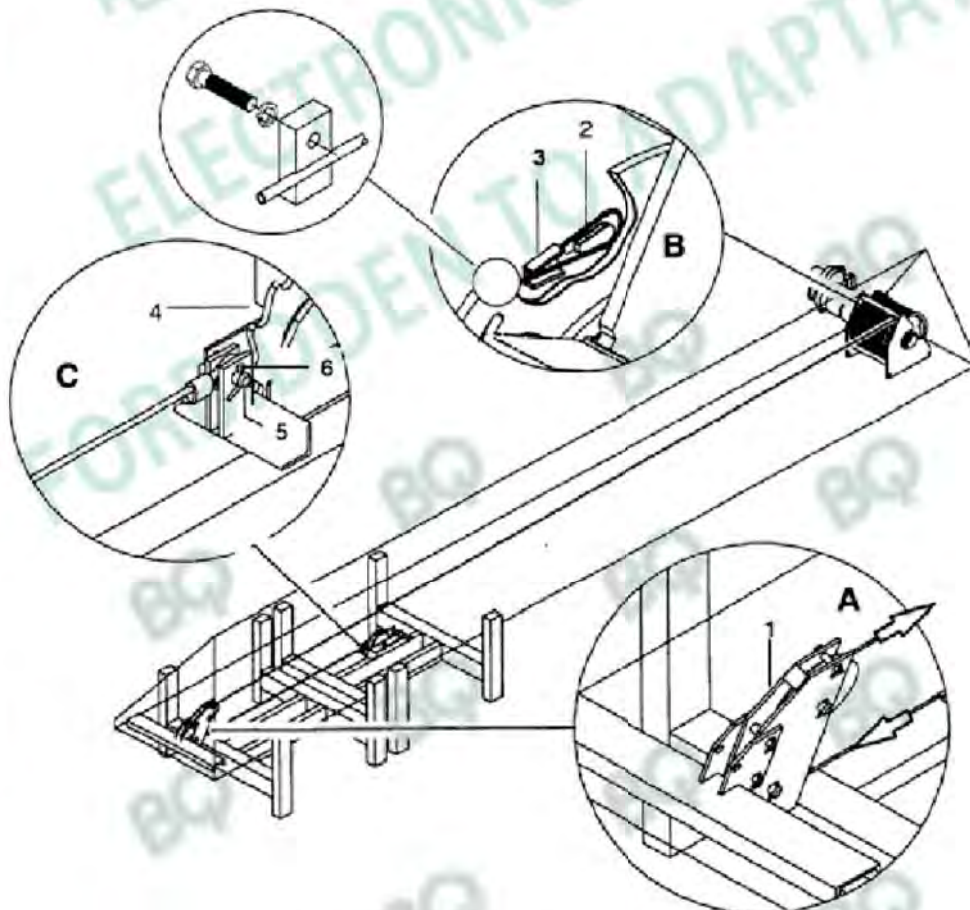
The rope length is determined according to length of the jib used.

9.5.2.1 Winding of Rear Wire Rope

- Drive the trolley to hold-down plate at the jib root.
- Unwind the rear wire rope from the rope coil.
- Insert one end of the rope without loop into pulley of removable pulley support (1)

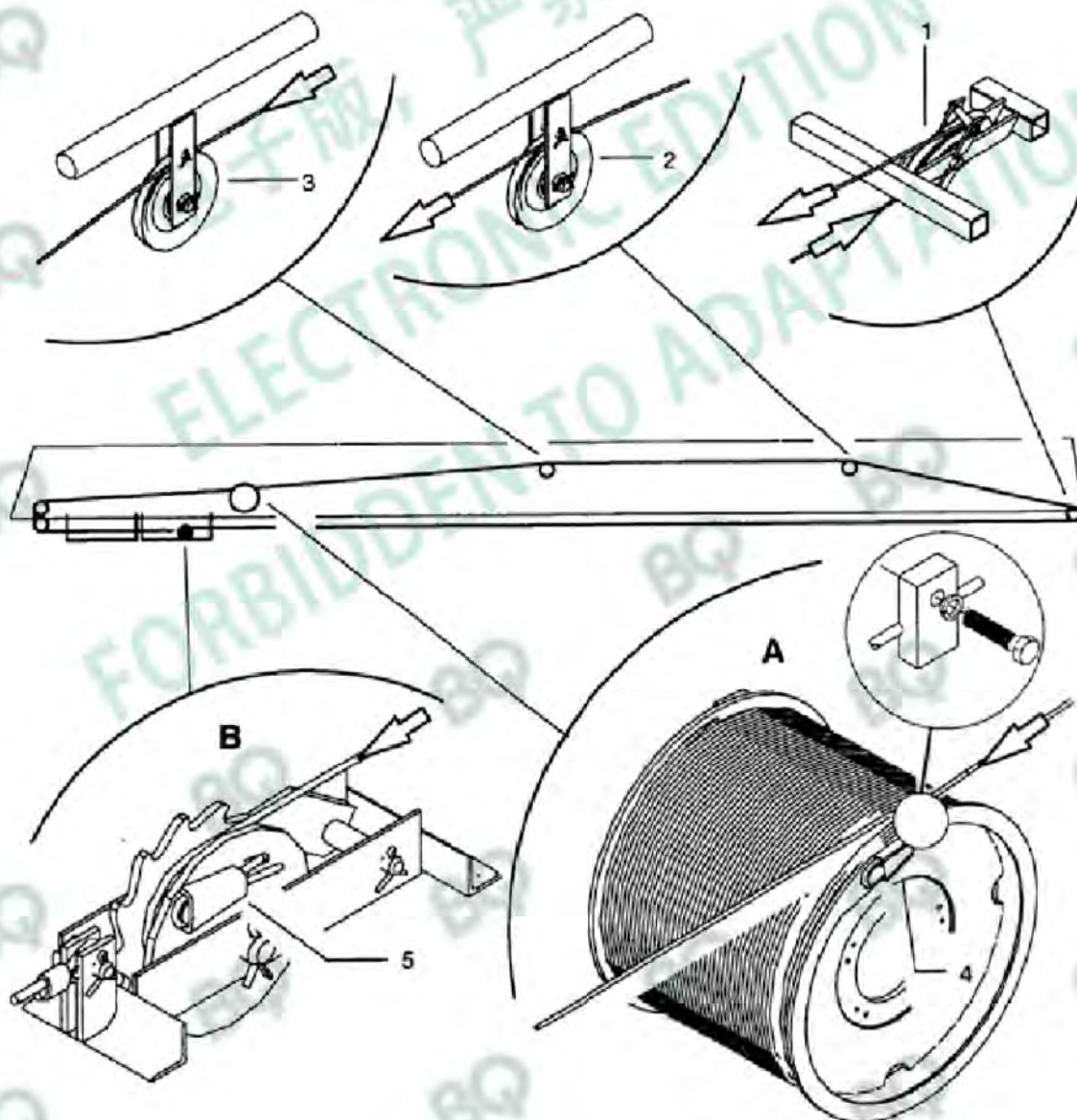
(Drawing A).

- Use wedge (3) to fix the end onto drum (2) (Drawing B).
- Wind the rope onto the drum, till other rope end, which is equipped with a loop, arrives rope tensioner (4) (Drawing C).
- Use shaft pin (5) and cotter pin (6) to fix the rope loop onto the trolley (Drawing C).
- Tense the rear wire rope.



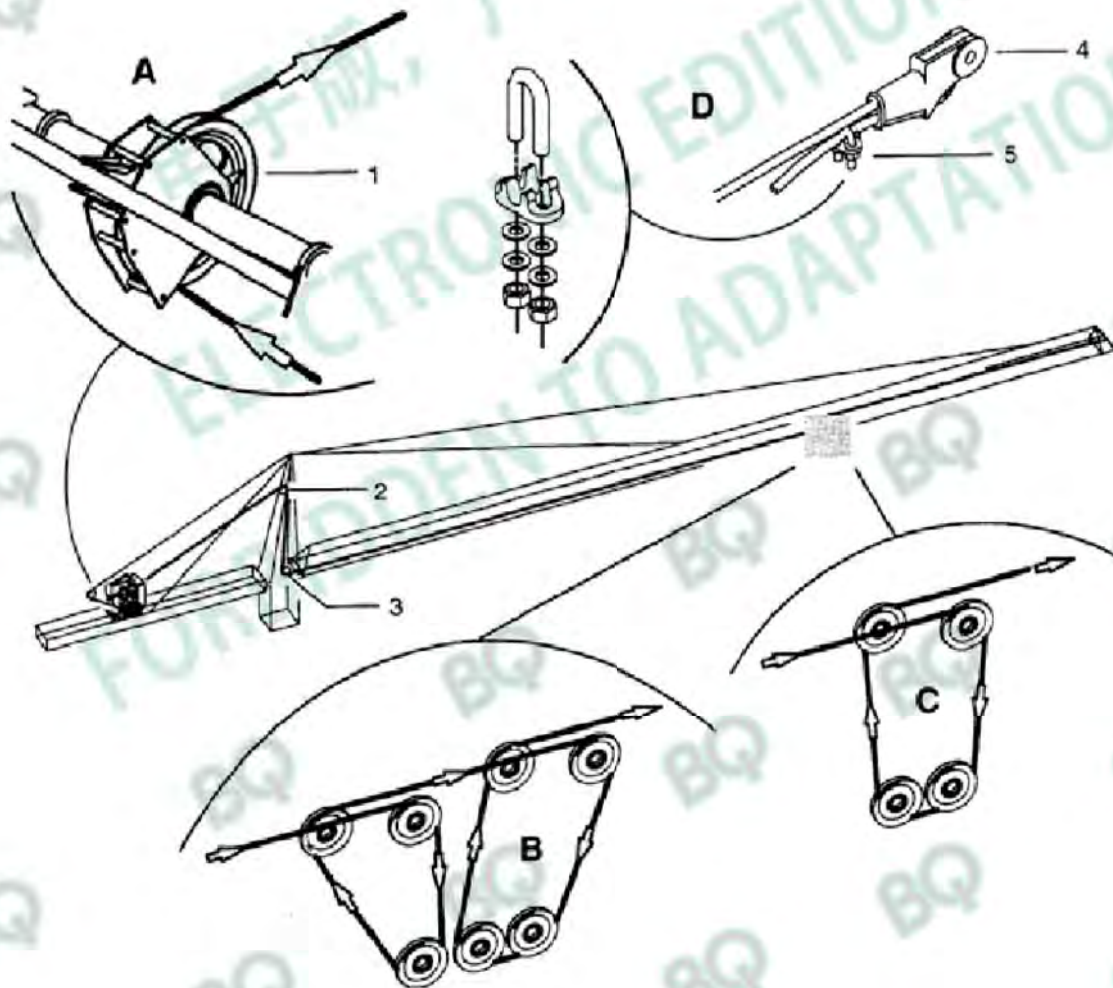
9.5.2.2 Unwinding of front wire rope

- Unwind rope from the rope coil;
- Pass the rope through pulleys (1), (2) and (3) (Fig. 2);
- Wind the rope onto the drum and wind for three circles onto drum (4), and then fix the rope end onto wedge sleeve (4) at side of the drum, and install rope clip (6) (Drawing A);
- Fix the other rope end at wedge (5) of the rope tensioner of the front trolley, and wind the excessive rope, till the front wire rope is tensed (Drawing B);
- Remove the trolley fixing rope;
- Check the rope tension.



9.5.3 Winding of hoist rope

- Pass the hoist through rope guider pulley (1) (Drawing A), crane cap pulley (2) and weight pulley (3) in sequence;
- Guild the rope to the trolley located at root of the jib;
- Wind the rope onto the pulley block as per Drawing B;
- The pulley block shall be padded at the ground vertically to avoid rubbing the rope;
- Install wedge sleeve (4) at end of the rope and install a rope clip (5) at its tail section. (Drawing D).



X Jacking

1 General Rules

When the jacking system has been jacked, rotation part of the crane must be balanced when jacking and introducing the mast section.

Wind speed shall not exceed 60Km/h.

Prohibitions:

Slew the jib.

Hoist load (up or down) when the jacking system has been or is being jacked.

The trolley moves when the jacking system has been or is being jacked.

Support the jacking system onto an oil cylinder.

Use safety pins in jacking.

The jacking climbing cage is provided with four pin rolls of which the diameter is reduced by 2mm, so that they can be put into place easily.

Such pin rolls, which are used in jacking only for connection between the lower base or connecting section between the nearest jacked section, are connected to the jacking climbing cage through a small chain.

The pin rolls shall be installed at sides.

Upon jacking completion and before pulling out pin rolls in connection between the jacking climbing cage and the lower base or connecting section and place the climbing cage down, replace such pin rolls with pin rolls of the mast section.

Before installation of standard pin rolls, hoisting operation is absolutely prohibited.

After jacking completion:

The last mast section shall be pinned onto the mast by standard pin rolls.

The lower base or connecting section shall be pinned onto the last mast section by standard pin rolls.

Balance weights used for balancing shall be removed.

There shall be no mast section suspended on monorail trolley, and the introduced trolley shall be placed on the ground.

Please the pulley block onto the trolley.

Keep trolleys away as much as possible so as to prevent beam movement caused by collision of pulley block when starting the wind vane.

Abide by applicable rules when the climbing cage is located on top of the mast.

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2 Balancing in Jacking

General Rules

Balancing in jacking is in two steps:

Theoretically, a substance shall be hoisted at certain amplitude.

Practically, substances are hoisted by adjusting position of one or two trolleys.

The jacking system shall be in good working condition (oil cylinder and climbing cage), gravity center of the jacked part shall be in center line of the oil cylinder, and ensure one mast section is on monorail before balancing.

In addition, wind speed is a factor which could not be ignored for crane balancing, and no jacking is allowed when wind speed exceeds 60Km/h.

May we once more remind you that when the jacking system has been or is being jacked:

Do not slew the jib.

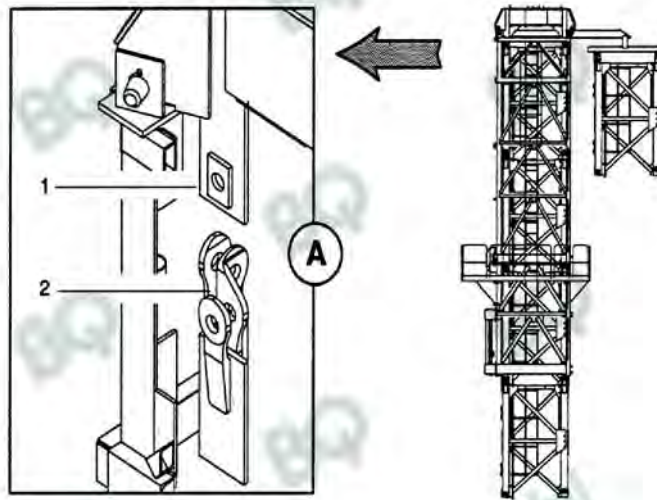
Do not move trolleys.

Do not lift substances (up or down)

Balancing

- Hang a mast section onto the monorail.
- Pin the jacking climbing cage onto the support or linkage section.
- Drive the trolley with or without load to balancing position.
- Pull out pin rolls of the mast section connecting the support and linkage section.

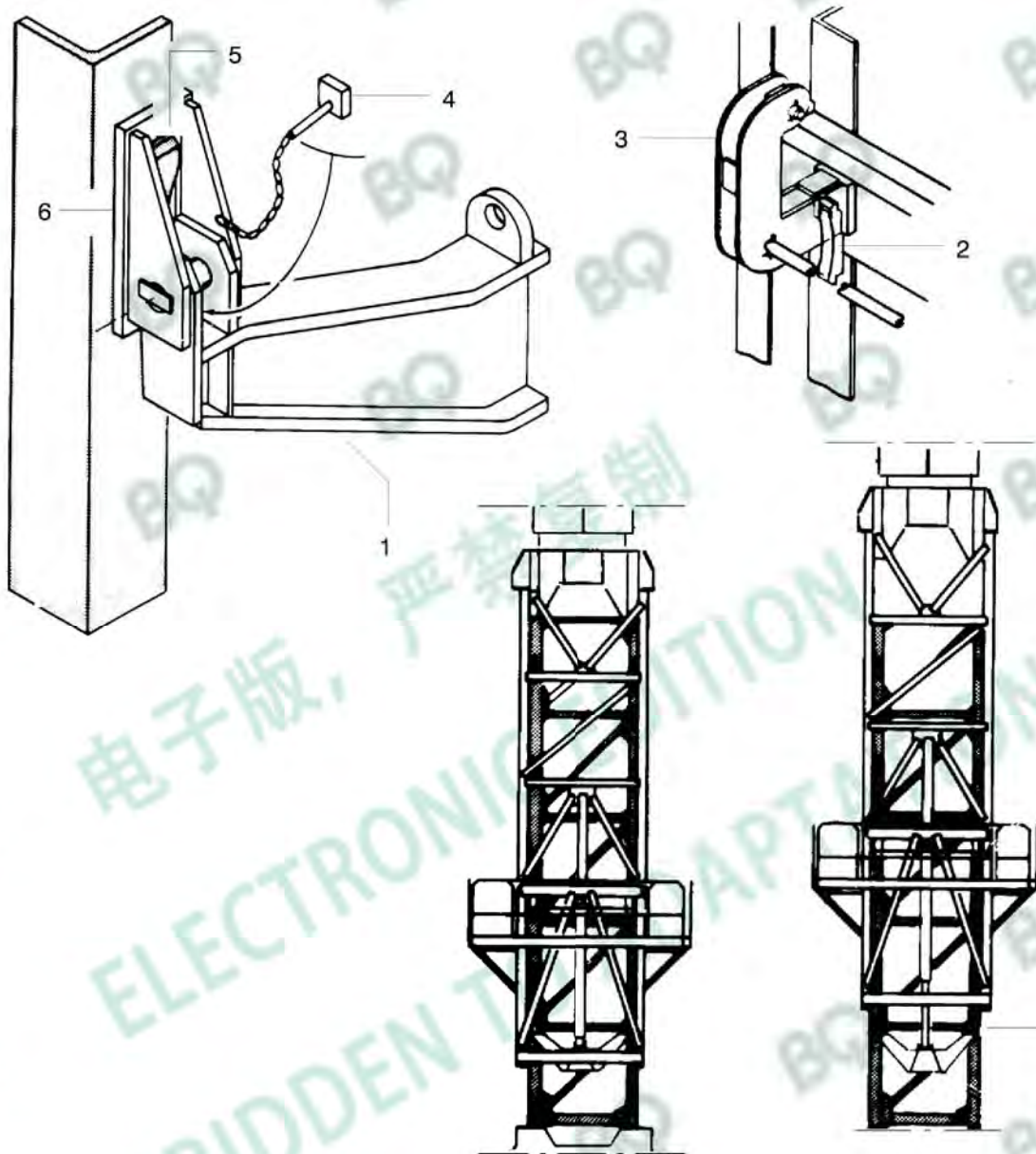
Balancing can be realized only when support angle (1) is pulled out from fish plate (2).



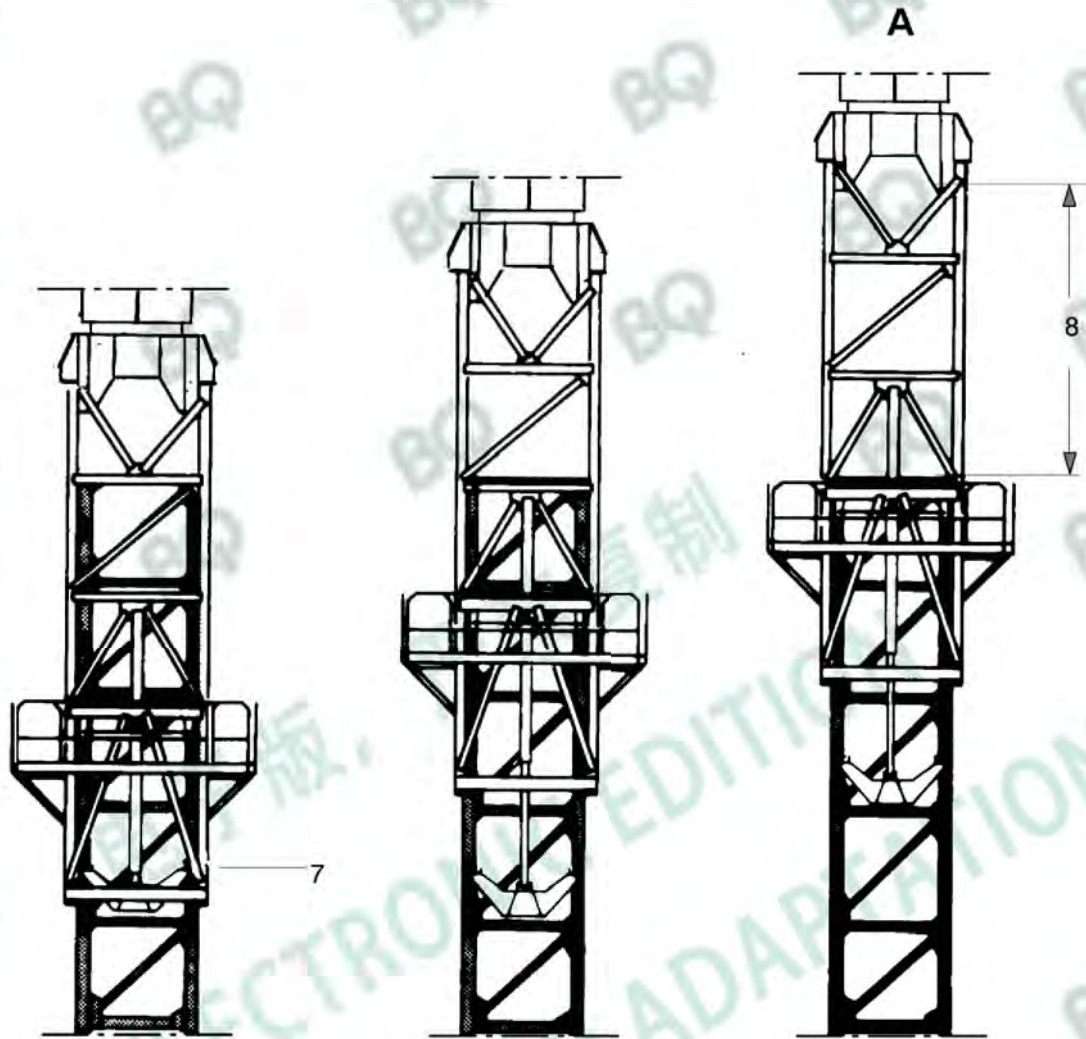
2m jacking steps:

Jacking shall be performed as per circular operation below:

- Lift the part to be jacked by extending the oil cylinder located on cross beam (1).
- Place the part jacked onto step (2) using claw (3) of the climbing cage.
- Pull out safety locking piece (4) connecting claw (5) and step (6).
- Loosen assemblies of the claw cross beam to make it leave the step, and then shrink the oil cylinder and lift it up again.

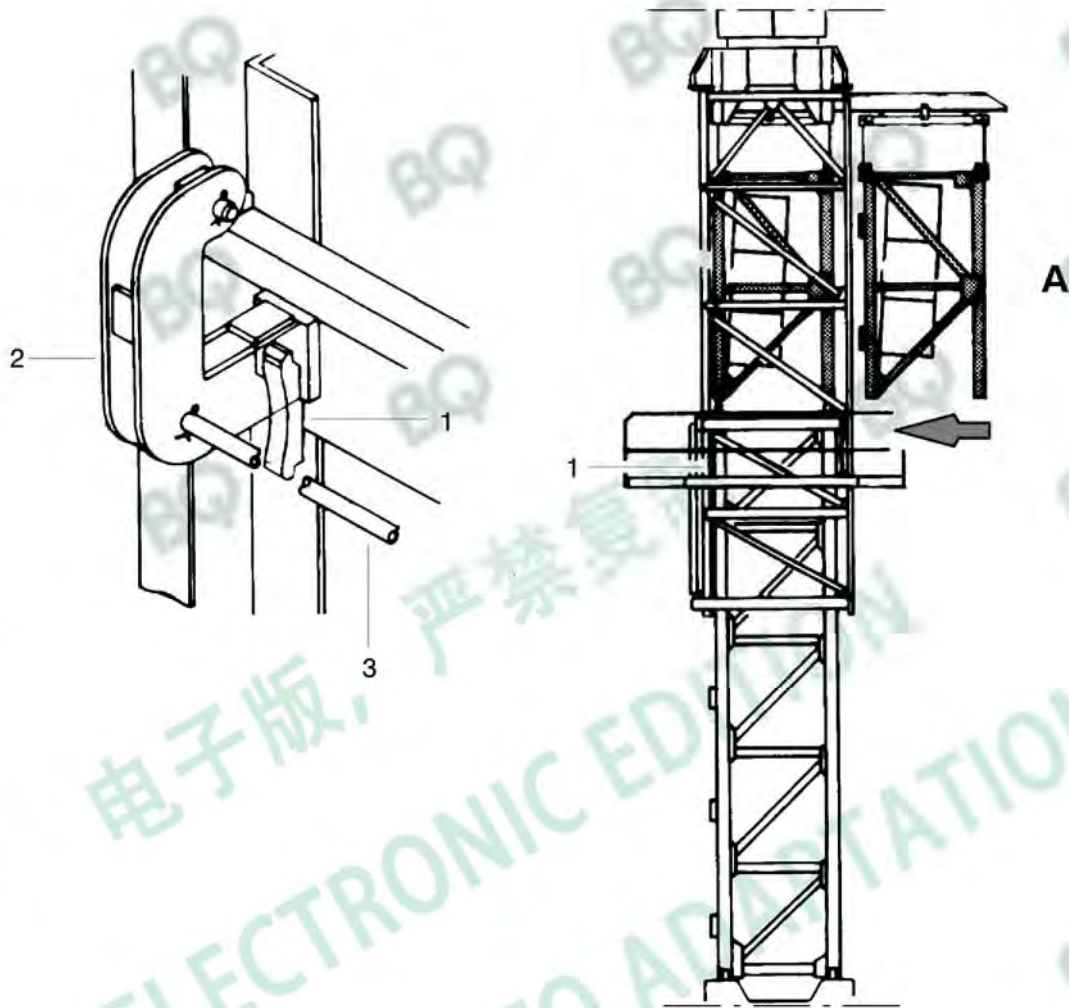


- Place the whole unit onto a group of step (7).
- Repeat the operation mentioned above for three times to obtain a sufficient close distance (8) to introduce climbing cage of the mast section.

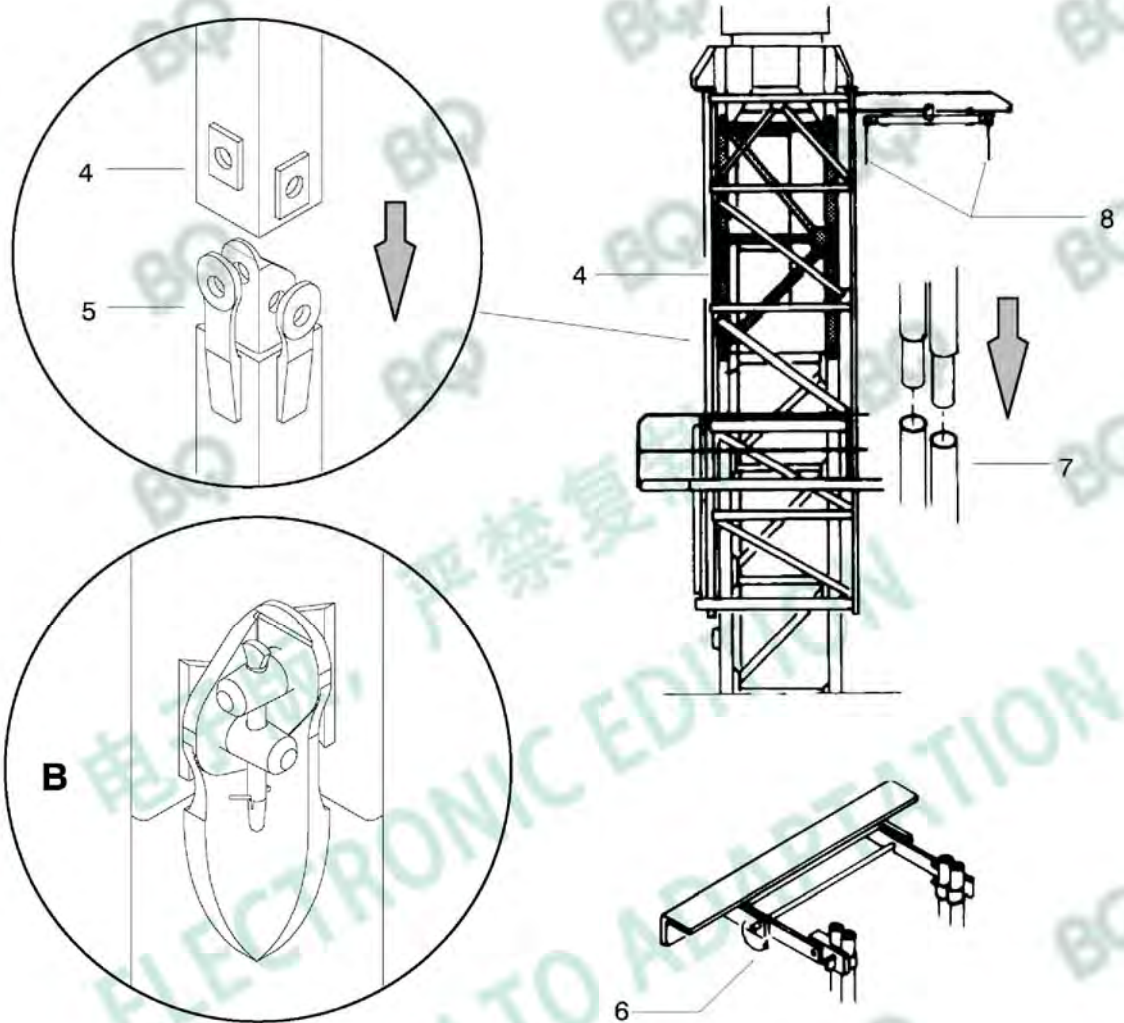


3 Introduction of Mast Section

- The jacked part is supported onto upper step (1) of the mast section through claw (2) of the climbing cage, and the mast section forms a tower. At this time the oil cylinder almost extends out completely, and the total travel extended shall not make the guide pulley in upper part of the climbing cage separate from the fixed part.
- Push the mast section in, till it is pushed into the climbing cage, see Drawing A.
- Operate the hydraulic station in “up” direction to separate claw (2) from step (1), and separate the claw from the mast by using control lever (3).



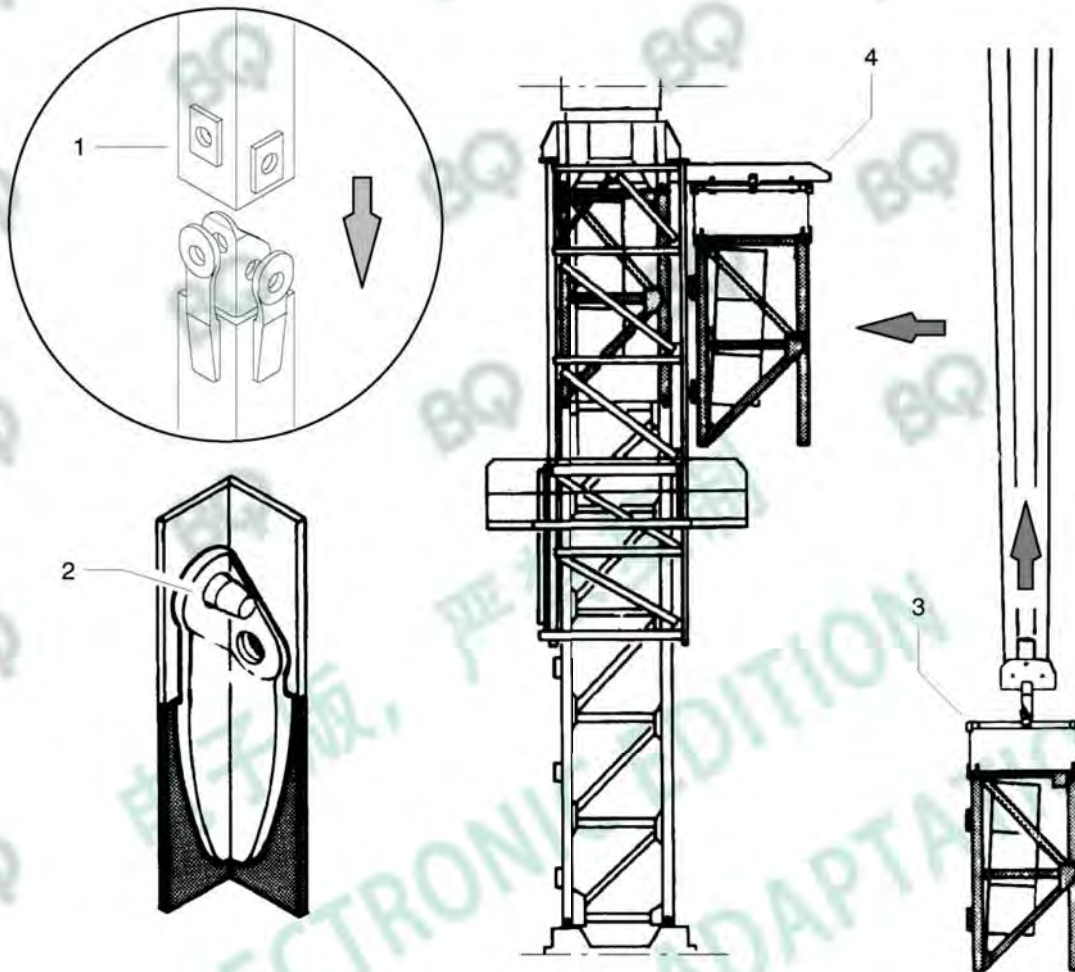
- Operate handle of the hydraulic station in “down” direction to insert mast section (4) into fish plate (5). Fix the mast section with pin rolls and cotter pins according to Detail B. Lift up the escalator connected at (6) and insert its angle into escalator (7) of the lower mast section.
- Loosen the bolts of the monorail trolley at four connecting points fixed on mast section (8), and then pull the trolley out from the climbing cage.



4 Place the second mast section on monorail

- The mast section can be hoisted and placed onto monorail only when the jacked part is fixed at the lower support.
- For this reason, operate handle of the hydraulic station in “down” direction, till support angle (1) is inserted into fish plat of the mast section installed just now.
- Place four safety plug pins at pin roll (2).
- When necessary, remove the balanced load and hang the monorail trolley onto pulley block.
- Hang a new mast section with passage onto the monorail and hoist it up to monorail (4).
- When necessary, hoist the balanced load again for balance. Loosen the pin at (2).
- Repeat jacking process above till reaching the height required by the crane.

The last mast section shall be fixed with the crane and support angle.



XI Inspection before Use

1 Introduction

The purpose of crane inspection before use is to make sure that the crane can operate properly and works normally under safe conditions.

Such inspection includes:

- Inspect installation process of the crane to eliminate potential safety hazard for safety running.
- Adjust safety devices of the crane.

2 Inspection after Installation (Fixed Parts)

In order to ensure safety, the crane shall be subject to inspections below after installation:

Cross Beam on Travelling Mechanism

- Travelling tower crane
 - Check electric connection of the travelling mechanism
 - Check installation of the cable drum
 - Check distance from the power cord to middle position of the track
- Stationary tower crane
 - Inspect the rail clamping device and other fixing devices
 - Inspect electric wiring of the travelling mechanism
 - Inspect fixing of ballasts
 - Inspect fixing devices out of service
 - Inspect if cables pass below the cross beam properly

Stationary Cross Beam

- Check fixation of the following connection: on jack
 - On cement block
 - On cushion block
- Inspect fixing of ballasts
- Inspect if cables pass below the cross beam properly

Mast (crane without cab)

- Inspect if connecting pin rolls of the mast section are installed and locked.
- Inspect if cables are hung correctly on the hanging sleeve.
- Inspect if driving and maintenance rules are fixed on main chord of the lowest mast section.

3 Inspection after Installation (Rotation Parts)

In order to ensure safety, the crane shall be subject to inspections below after installation:

Jacking the climbing cage

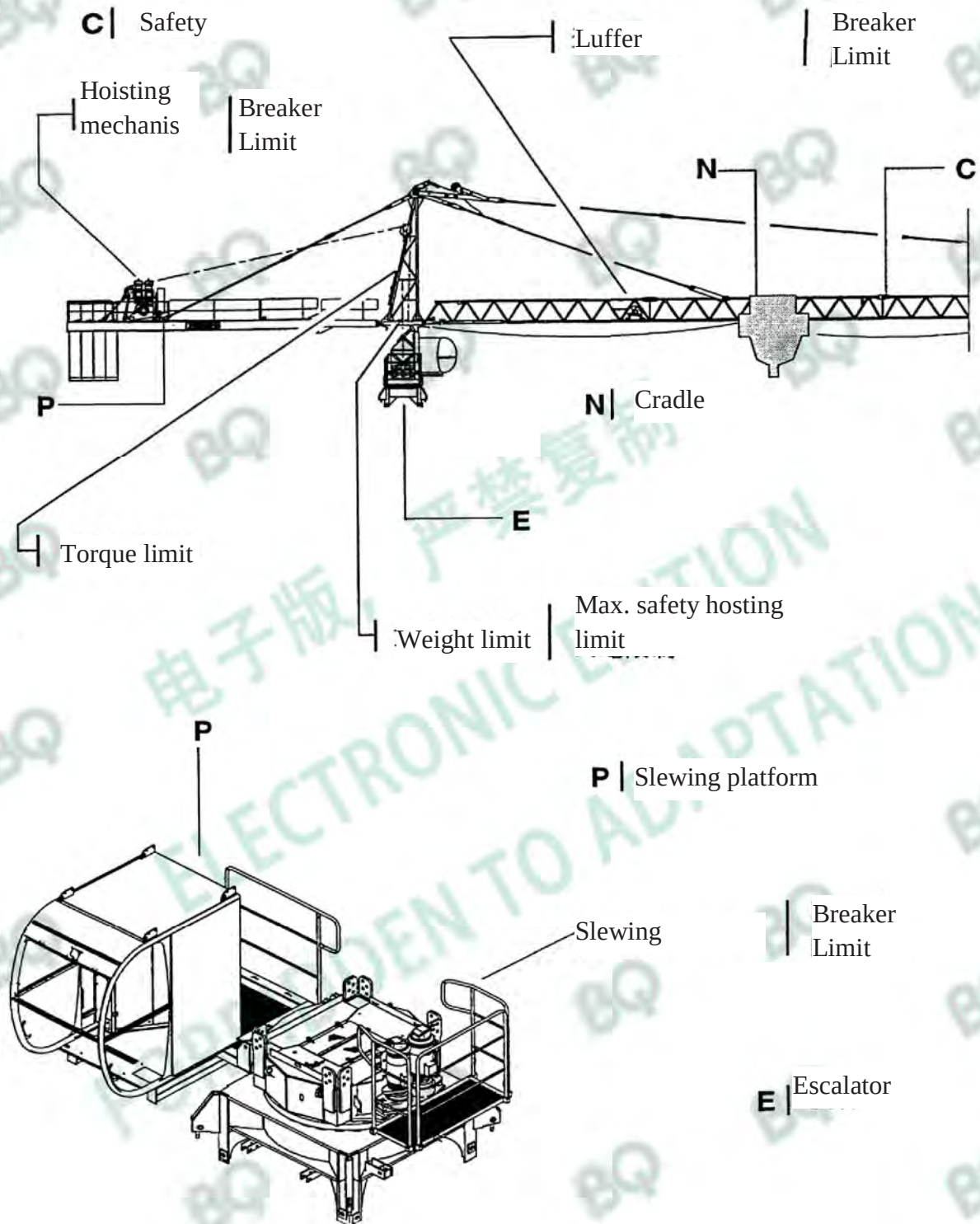
- Lower the jacking climbing cage and fold the monorail along the mast.

Cab

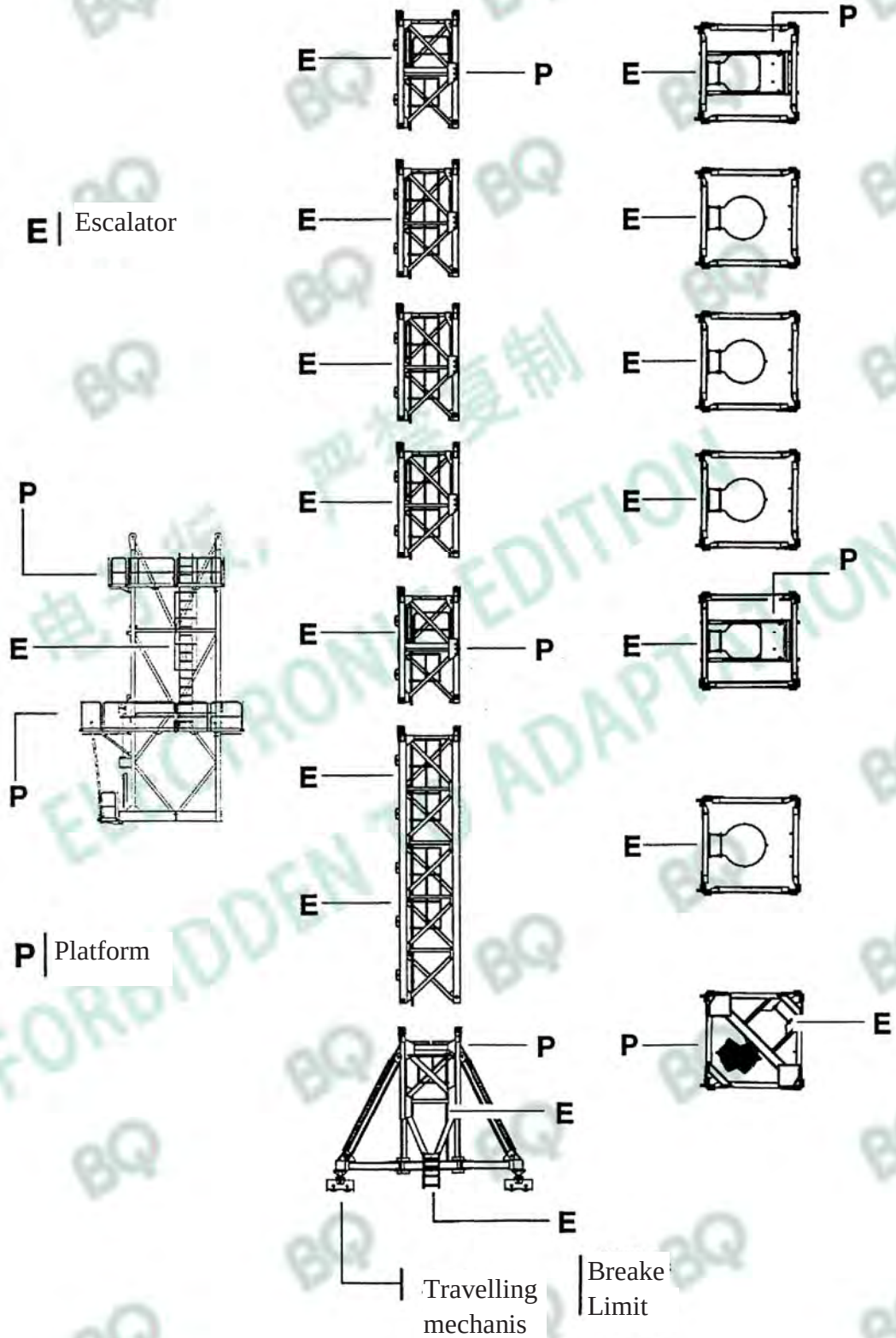
- - Inspect the cab support and passage handrail for their fixing.
- Confirm that the drive guide is put up in the cab.

Crane

- Inspect walkway and handrail of the balance arm for their fixing.
- Inspect the safety rope installed on the jib frame.
- Inspect winding of the power cable against its instruction.
- Inspect winding of the hoist and luffing ropes.
- Inspect the walkway for any obstacles.
- Inspect oil level and lubrication point against the instruction.



4 Various Passages and Safety Devices



Section 3

1 General

-All special rules about tower crane installation and mast section addition are applied to tower crane disassembly and mast section removal.

-All special rules relevant to disassembly and mast section removal are given in detail in the following pages.

- Final disassembly step can be totally completed by autocrane, but one part (discharging balance weight) also can be completed by lifting hoist according to the construction site conditions, this requires that electrical connection shall not be removed temporarily.

-If disassembly of tower crane is totally carried out by autocrane, it shall check if elevating capacity of autocrane is enough.

- Airspeed shall not exceed 50 km/h during disassembly and mast section removal.

1.1 Preparation before disassembly

Confirm that no barrier obstructs disassembly work.

For mobile-type tower crane:

-Drive the tower crane to the section where disassembly is carried out.

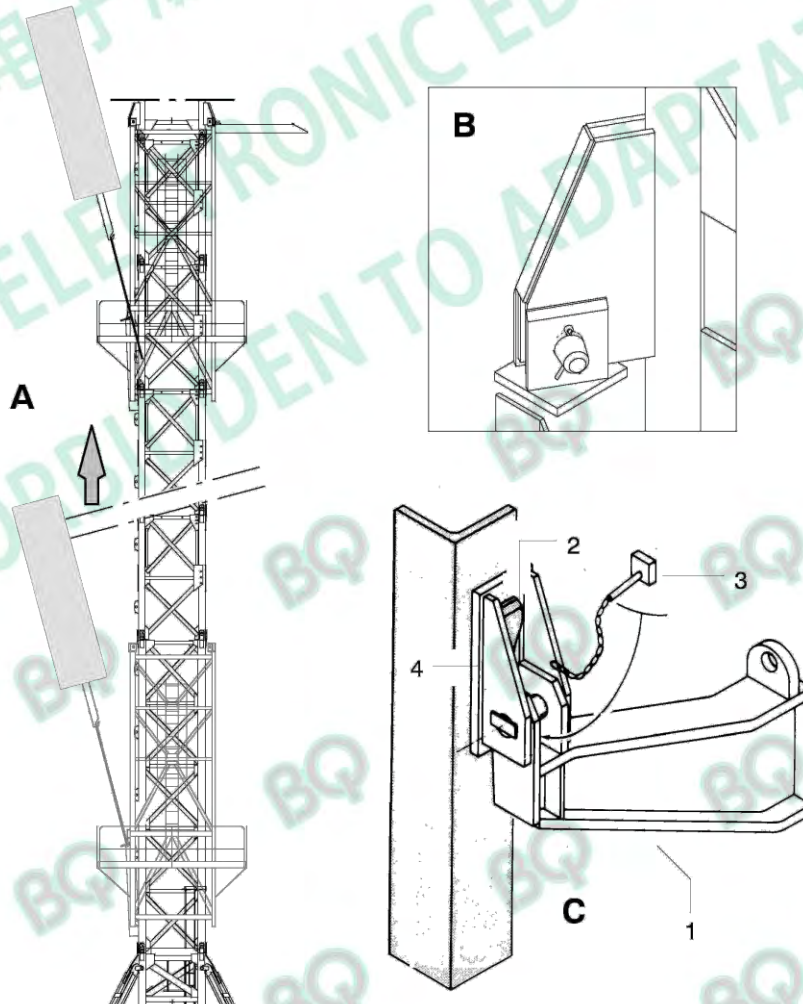
-Lay down the rail clamping device and clamp it to the rail.

2. Disassembly of Mast Section

2.1 Preparation before disassembly

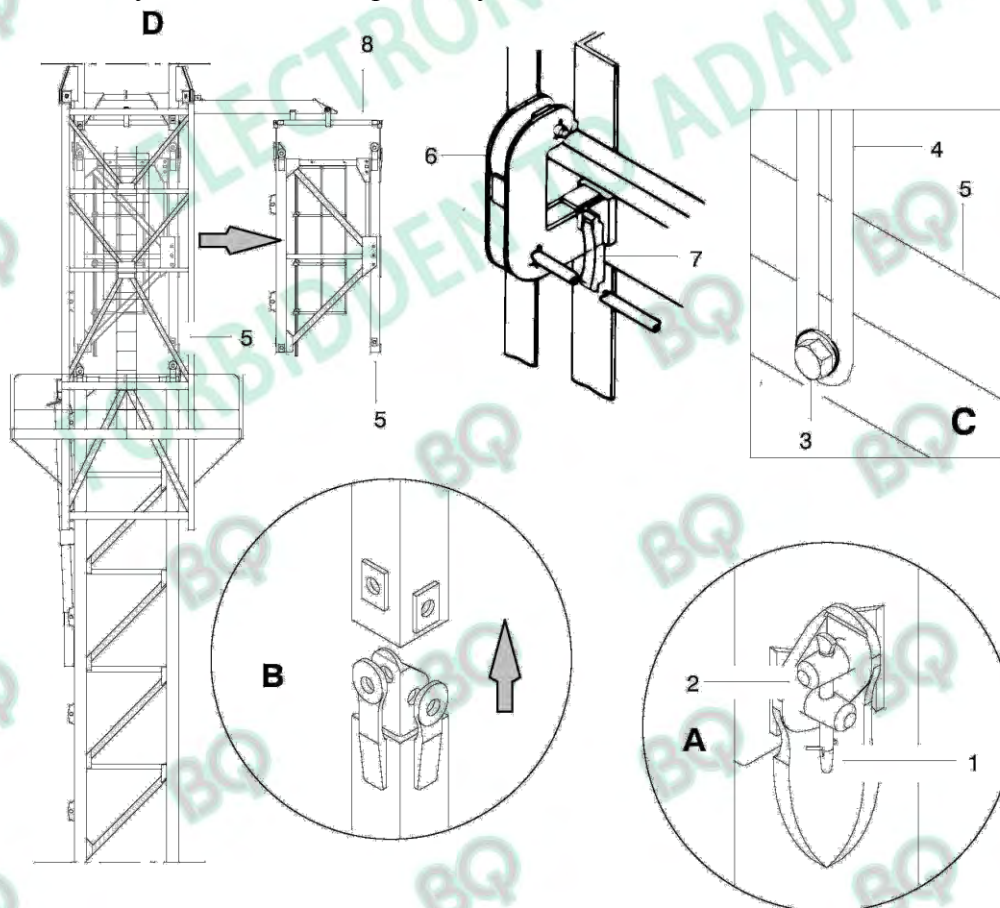
- Lift the jacking frame to the top of tower body and fix its four corners with pins (see Fig. A and Fig. B)
- Erect a ladder for support channel
- Install jacking part, and pay attention to the following points at the same time:
 - Fix jacking beam (1) to the fifth group of step (2) calculated from the support with pin (see Fig. C).
 - Install a monorail trolley on the monorail and fix it to the mast section which shall be removed.
 - Rotate the cargo boom to the opening side of jacking frames.
 - Trim the tower crane according to jacking conditions

Note: Safety wedge (3) of climbing claw (4) shall be placed properly during decline (see Fig. C).



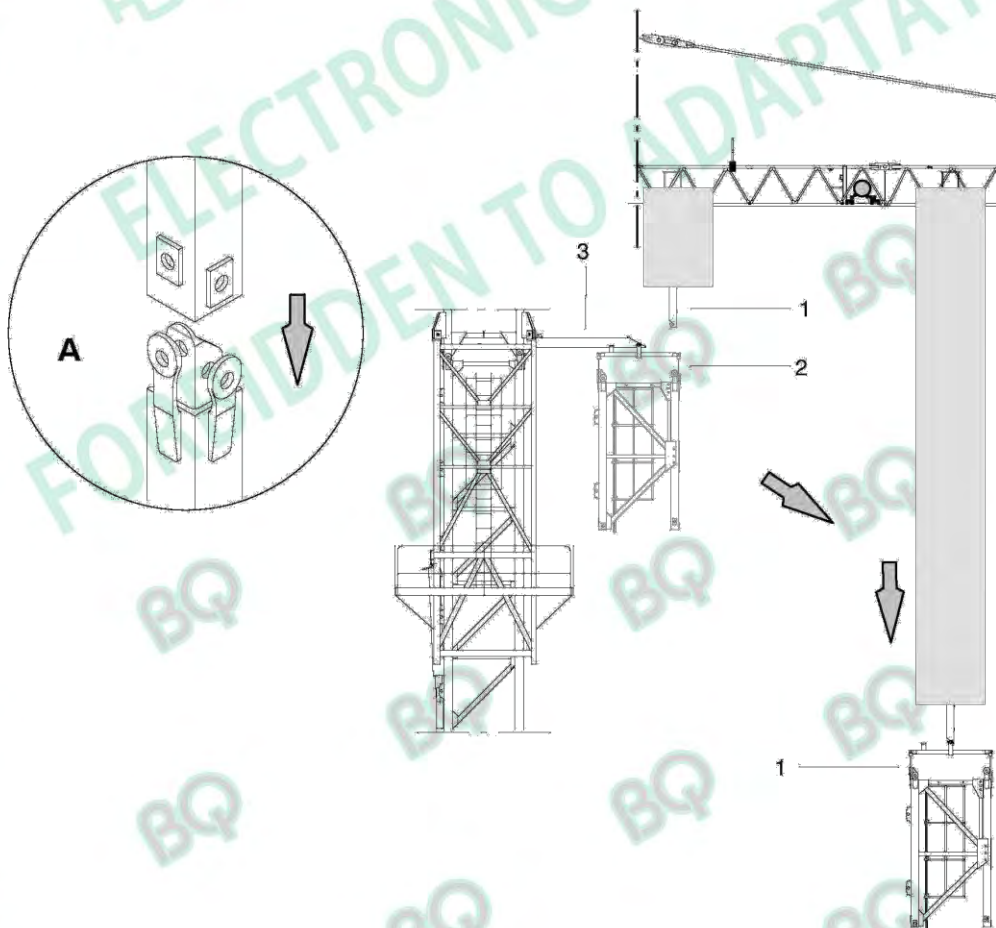
2.2 Disassembly of a 2m mast section

- Pull out plug pin (1) and shaft pin (2) connecting the mast section with lower support (see Fig. A) and jack them upward slightly.
- When the leg of the support is extracted for about 2cm from the fishplate (see Fig.B), stop jacking and fix set bolt (3) on monorail hook leg (4) to mast section (5) which shall be removed with pin (see Fig. C).
- Don't use full length of monorail hook leg (4).
- Pull out plug pin (1) and shaft pin (2) connecting the mast section with the lower mast section
- Withdraw the ladder.
- Carry out jacking "UP" operation till the mast section (5) is extracted from the fishplate, and then make frame climbing claw (6) fall on mast section step (7).
- Move monorail trolley (8), remove the mast section from the frames, and fold the ladder upward slightly to prevent the lower mast section from being hooked.
- Oil cylinder shall act repetitively for three times to remove next mast section.



2.3 Put the mast section on ground

- Carry out jacking “DOWN” operation till the lower support leg is inserted into a mast section beneath (see Fig. A), and install safety shaft pins for the four corners.
- Remove trimming load as necessary.
- Hang jacking hook (1) on monorail trolley (2), and then put the mast section on ground.
- Lift monorail trolley (2) again, and bring it into monorail (3) to connect it with the next mast which shall be removed.
- Lift trimming load again.
- Repeat the abovementioned operation till the tower body is totally disassembled.
- Remove the hydraulic component connection pipe, take it down after it is drained to be empty.
- Use the mast section shaft pin which is applied to work to connect the lower support with basic section.
- Remove the beam on the monorail.



3. Disassembly of Rotation Part

During hoisting load, it is required to use a sling with diameter adapting to it, and it shall ensure that the sling is in good condition.

Weights and centers of gravity of cargo boom and balance arm shall be given according to accurate composition of each packaging unit, and these compositions shall be abided by.

Important rules:

- When some parts such as cargo boom and balance arm are disassembled, some safety rules shall be observed to prevent the rest parts of the tower crane from losing balance during hoisting theses parts.
- When the cargo boom and the balance arm are removed, it is required to install a sling and a discharge ring between the part to be removed and the tower cap, and a tensioner shall be installed according to unbalance situation (up or down). Keep load stability via the tensioner, pull out the safety sling after the tensioner is tensioned, and operate the tensioner with the parts down.
- When operation is carried out at the root of cargo boom or balance arm, it is required to use the safety belt which is fixed to the tower cap.

4. Disassembly of Hoisting Wire Rope Cable



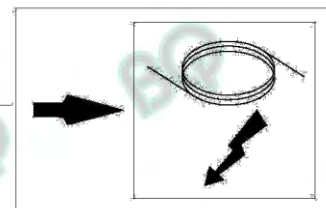


- Remove all accessories, structural parts and safety wire ropes or electric connection on other parts.

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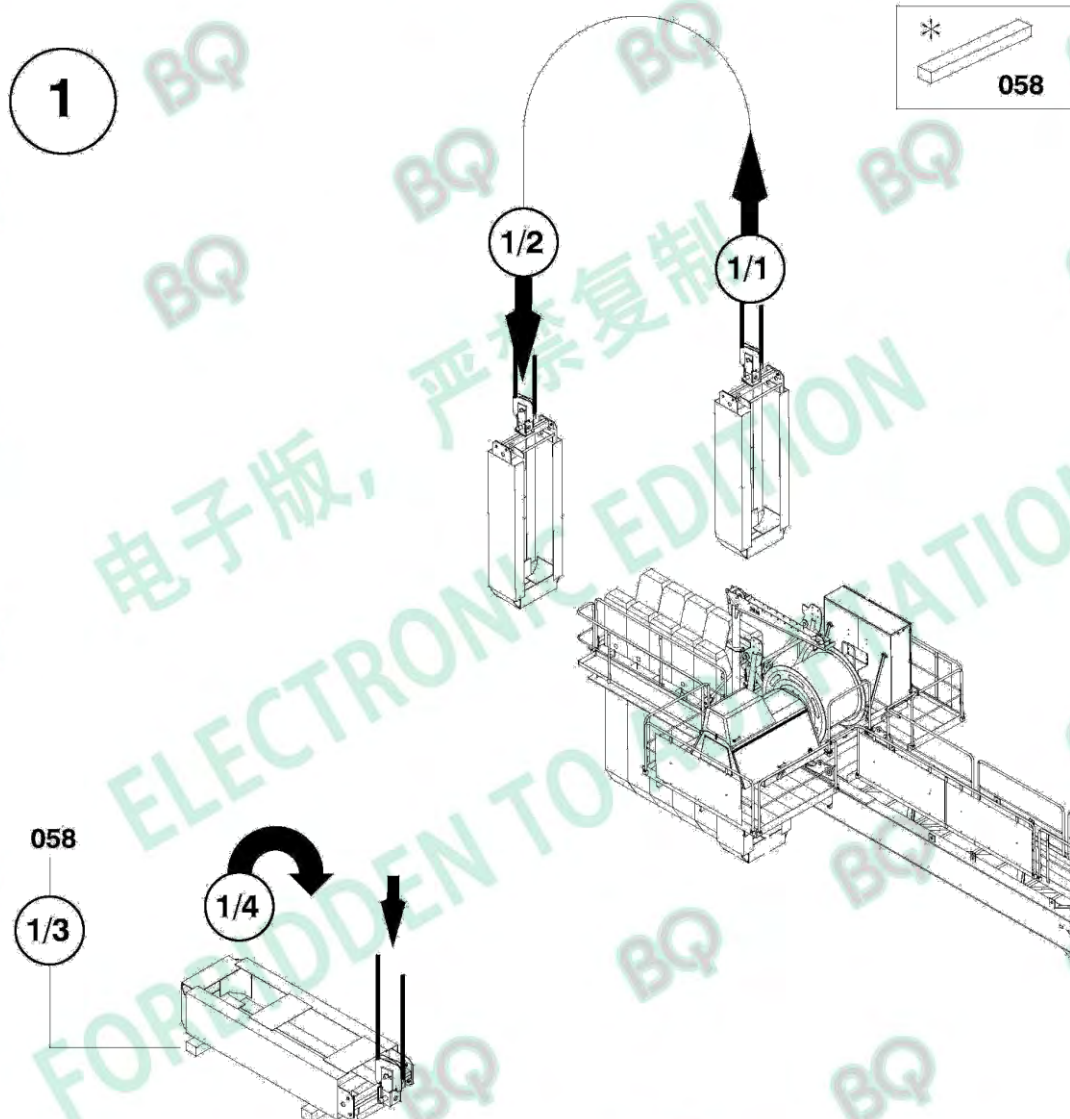


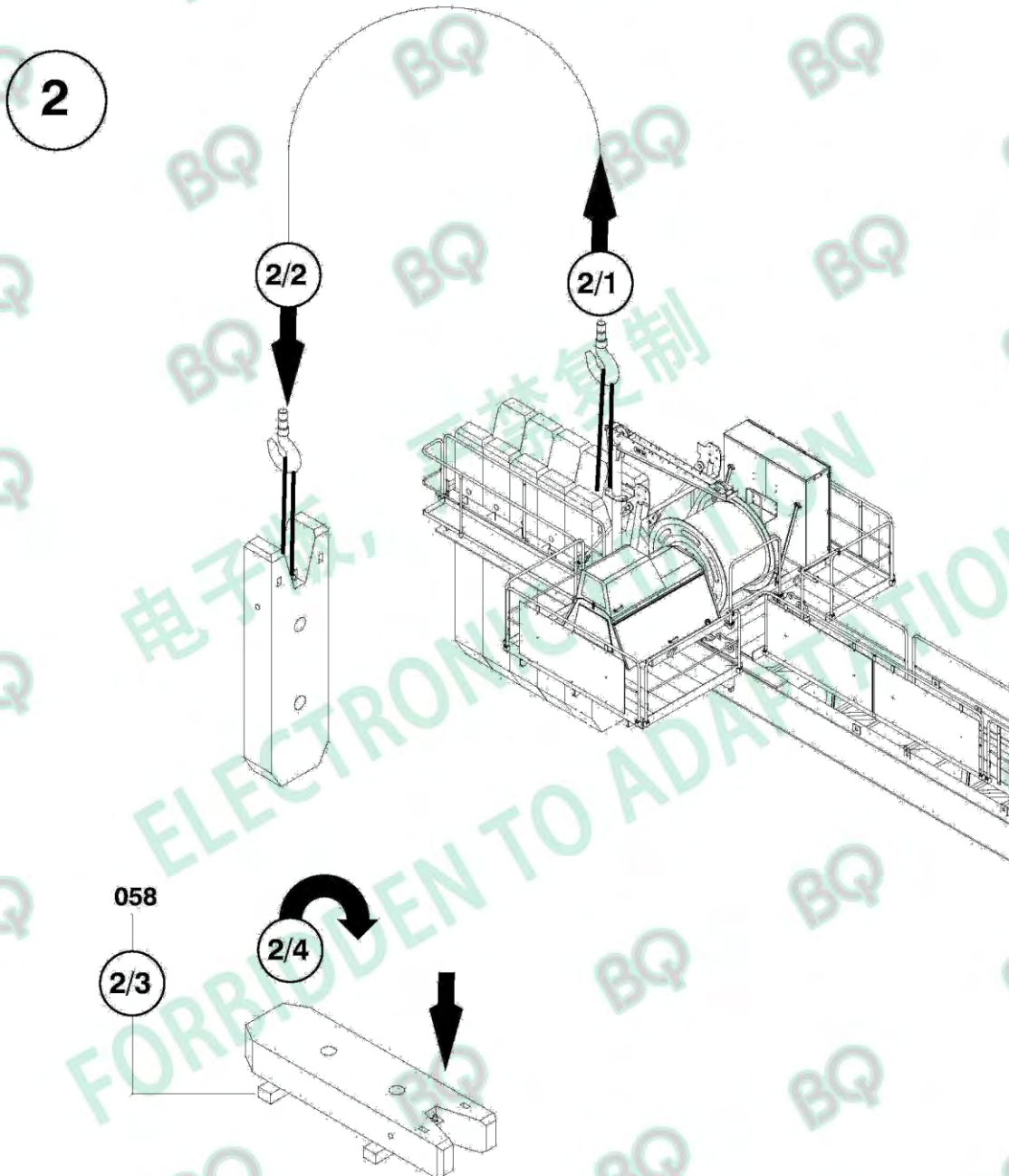
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5. Disassembly of Balancing Weight

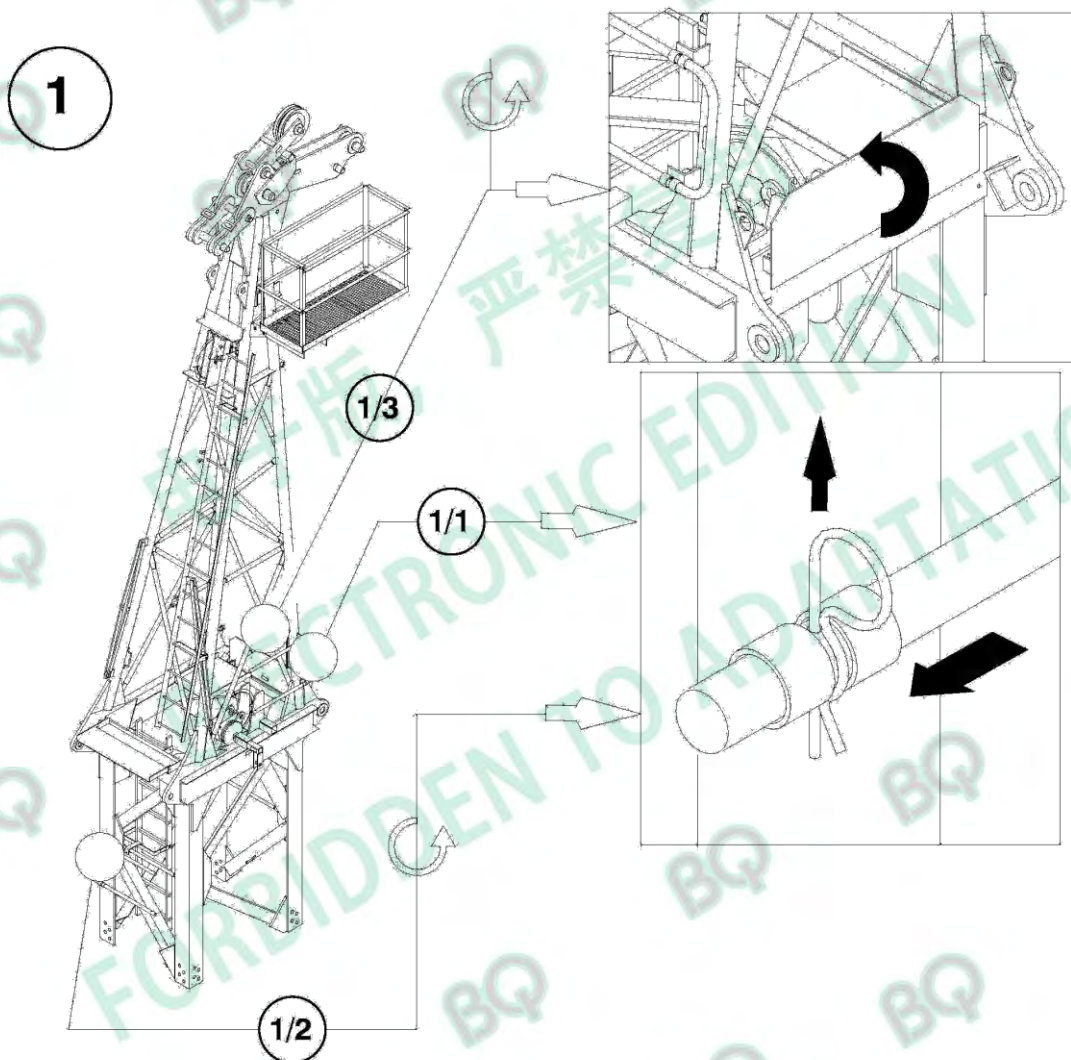
Note: when the cargo boom is removed, balance arm partial balancing weight shall be retained.

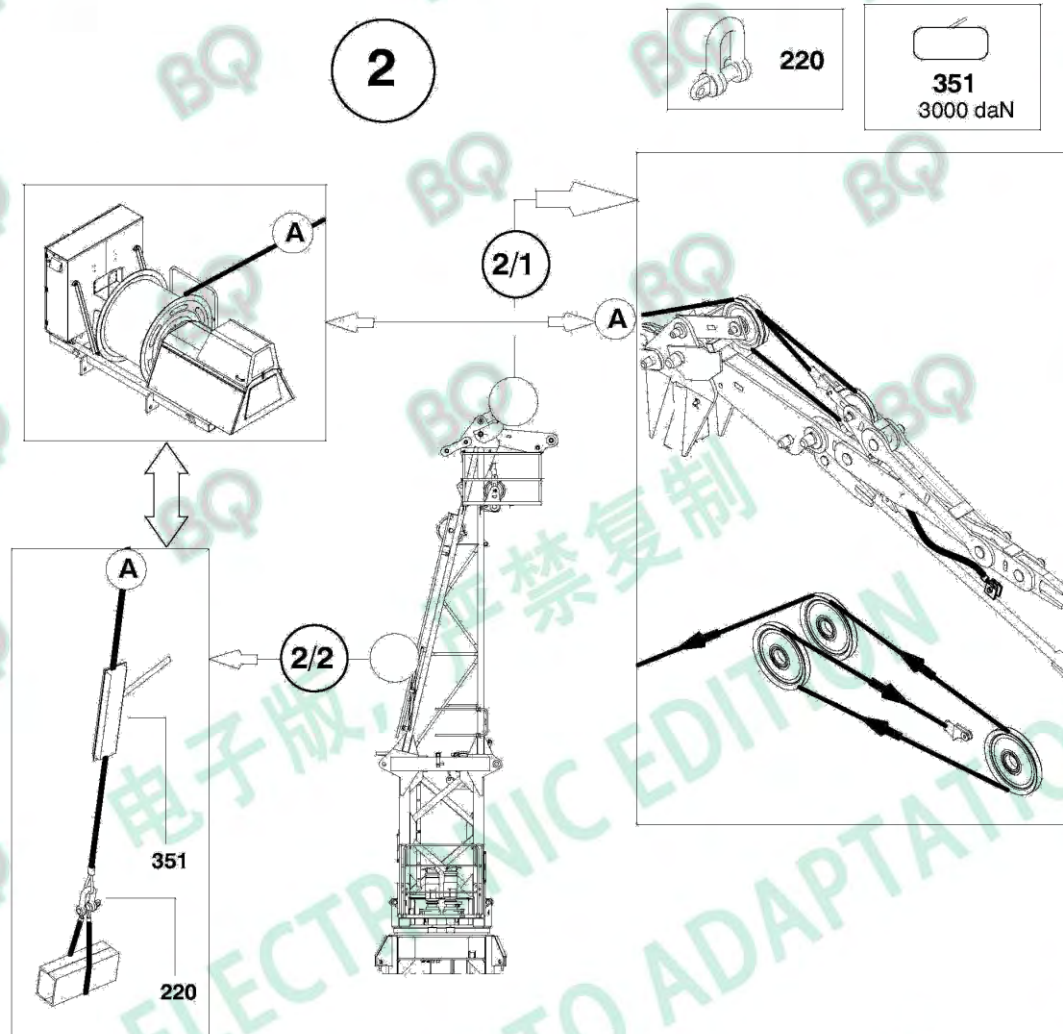




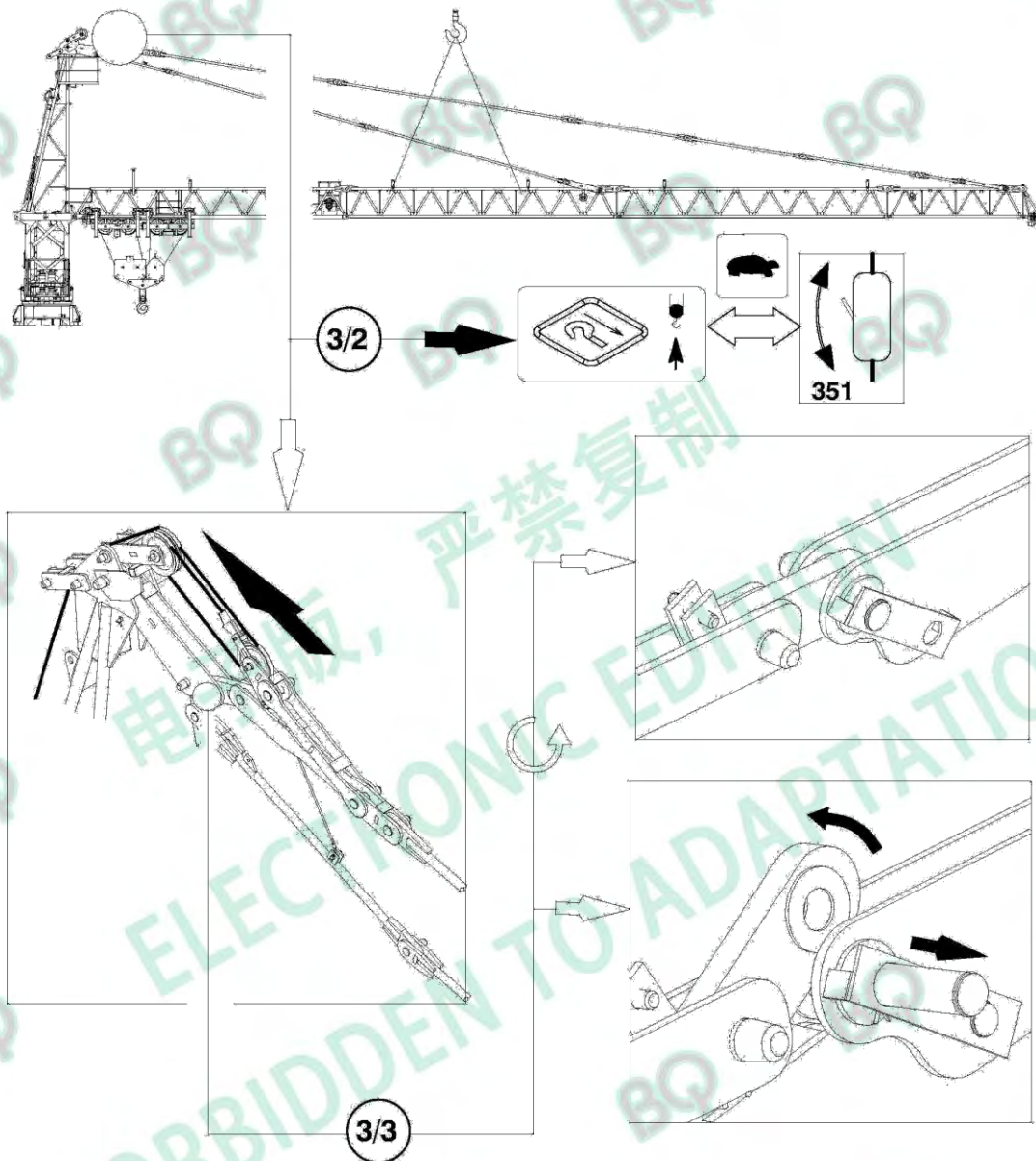
6. Disassembly of Duplex Pull Rod Jib

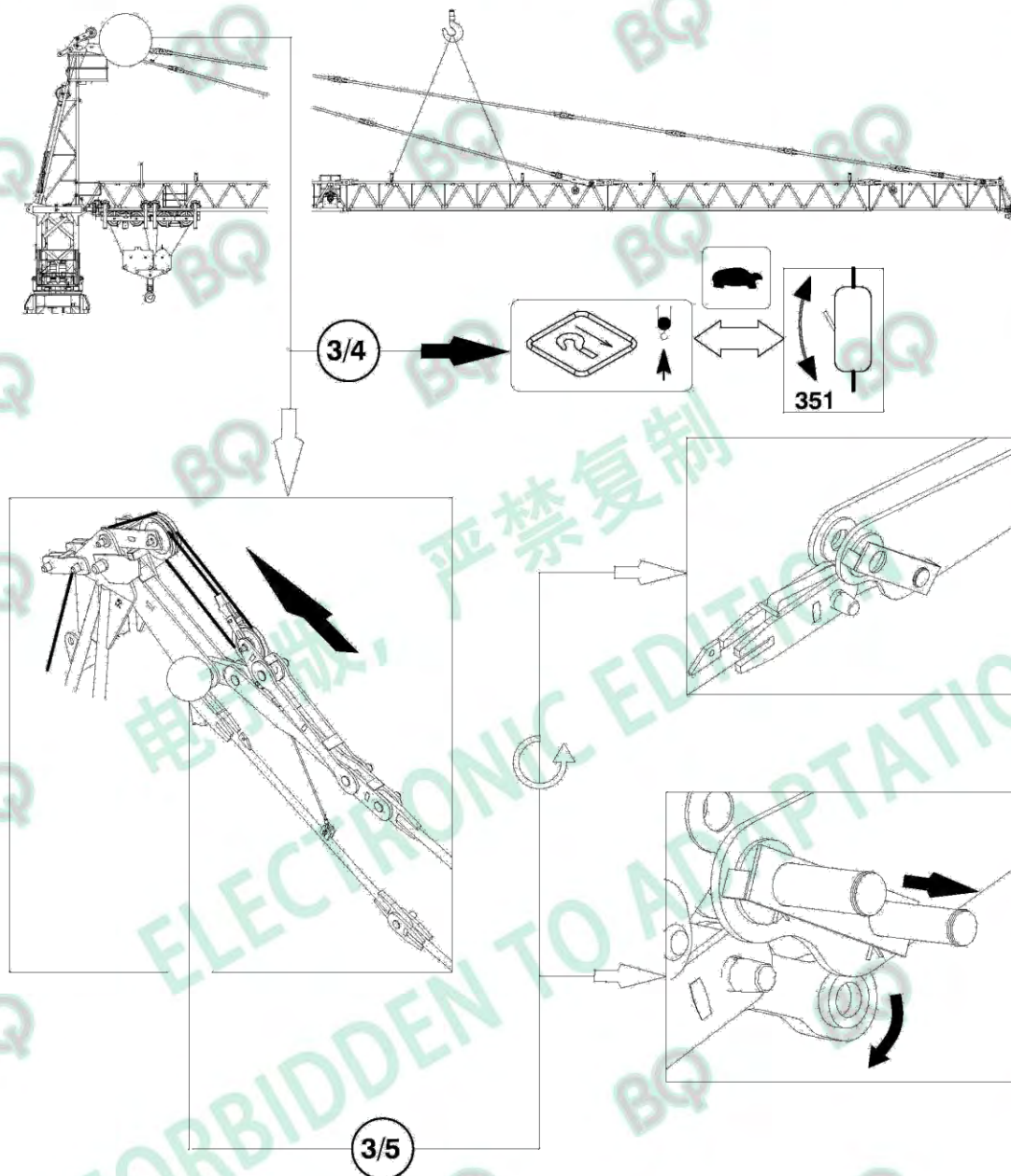
Note: when the cargo boom is removed, balance arm partial balancing weight shall be retained.





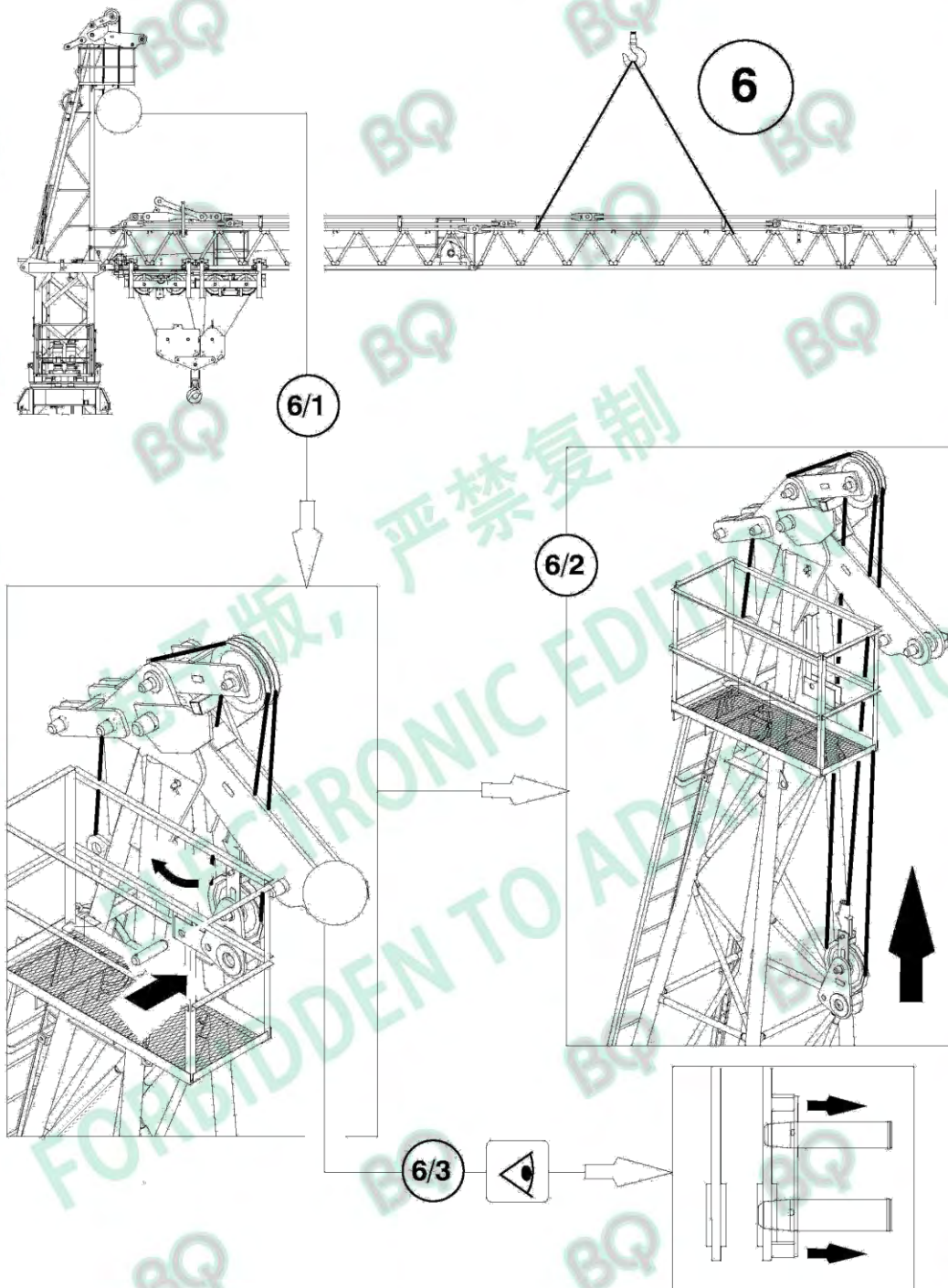


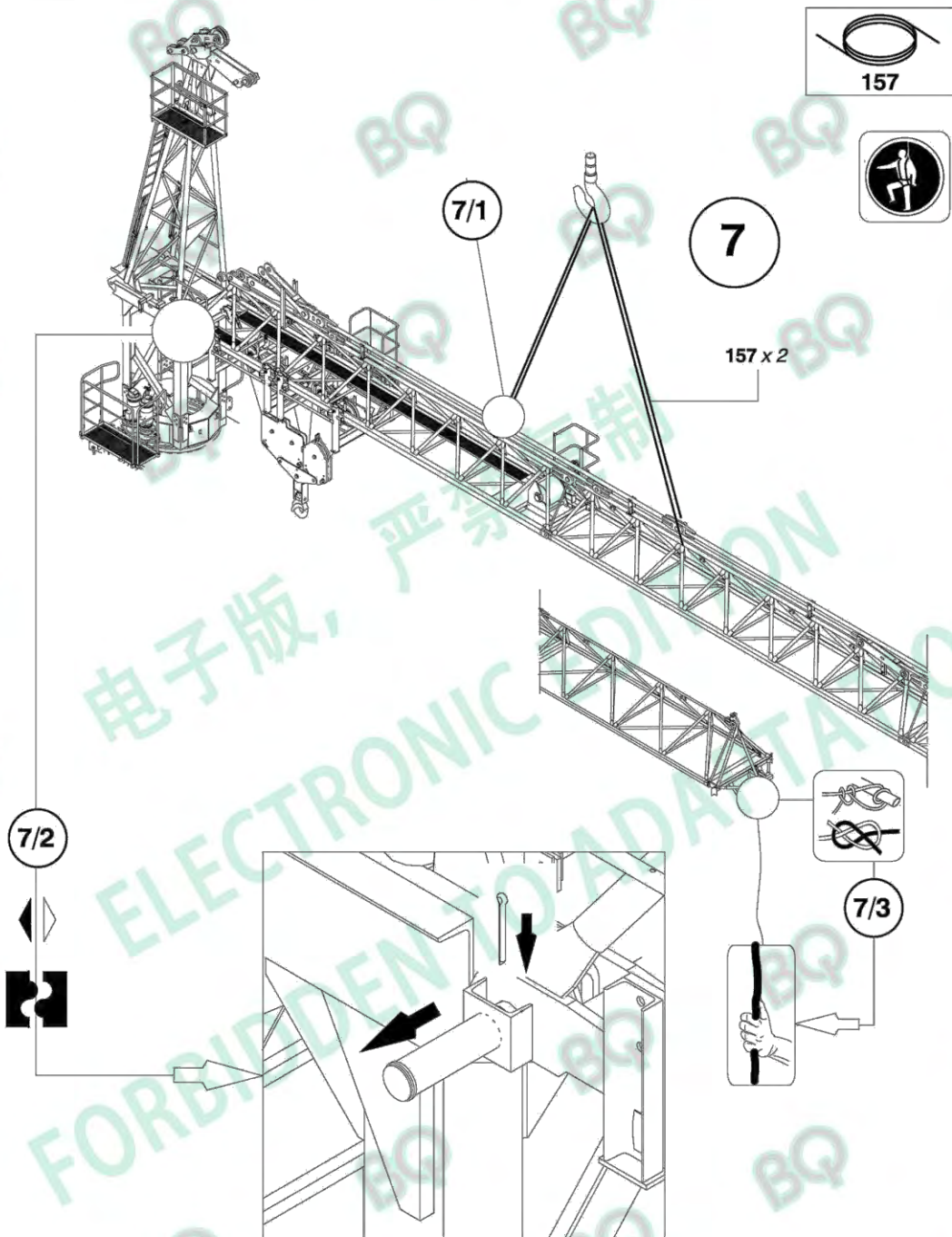








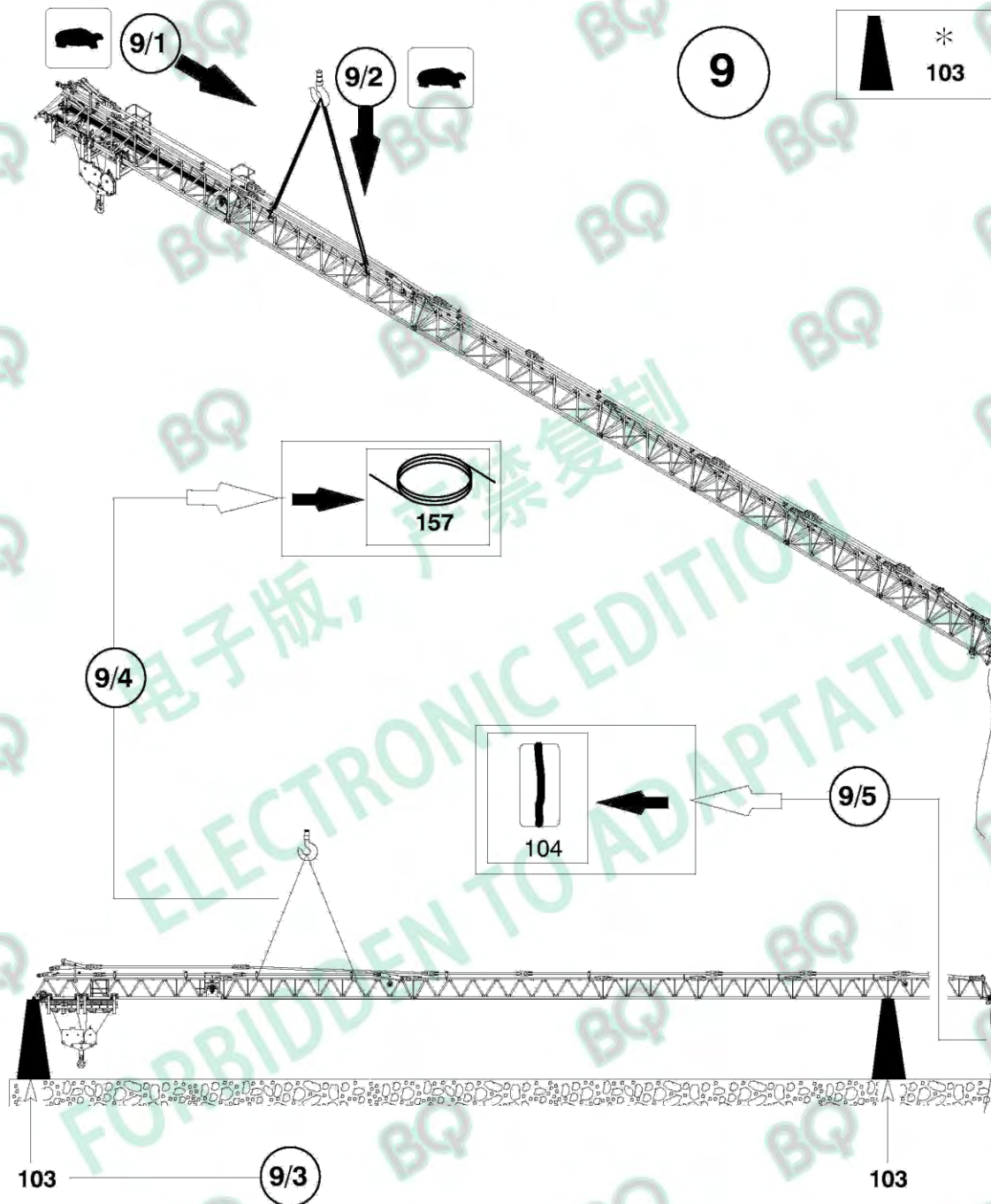






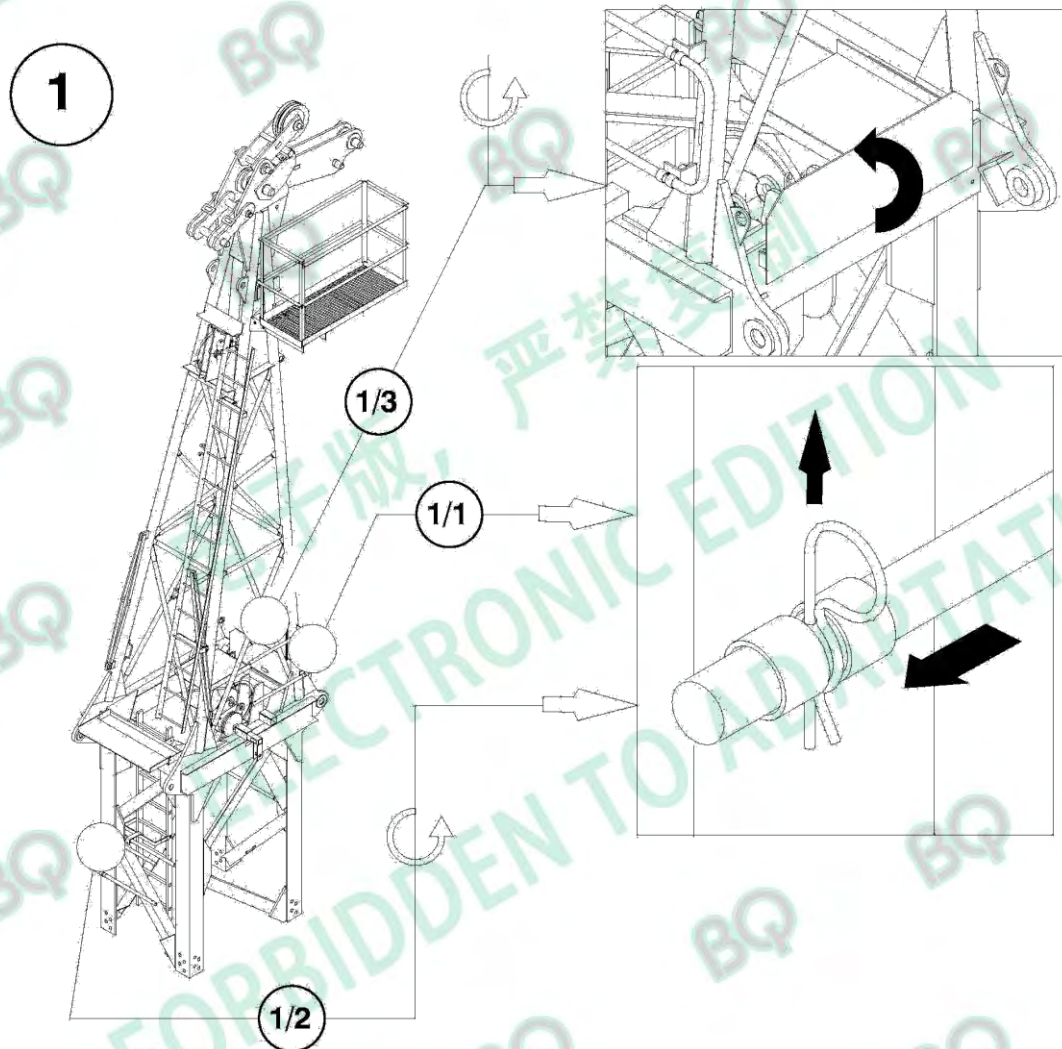
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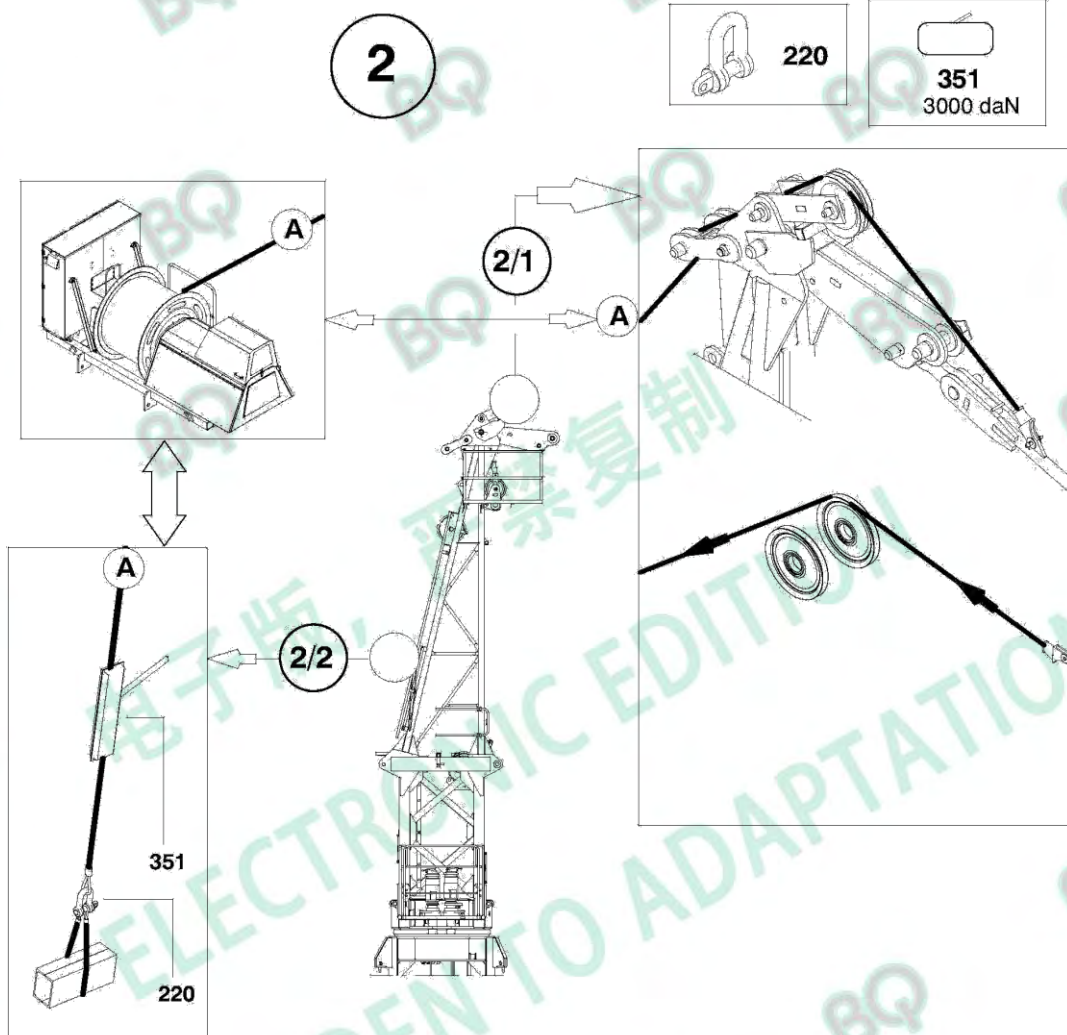
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7. Disassembly of Single Pull Rod Jib

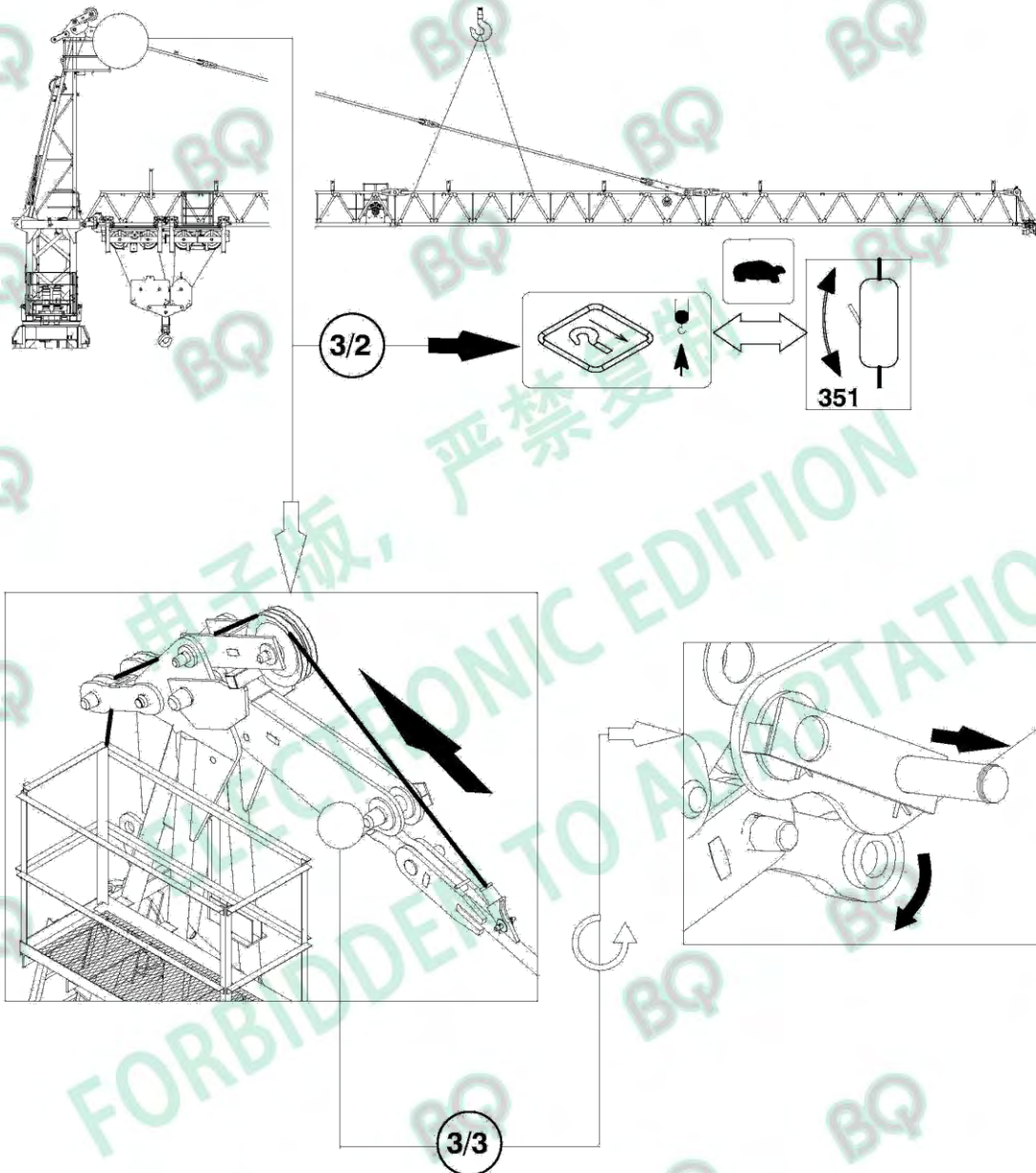
Note: when the cargo boom is removed, partial balancing weight shall be retained.







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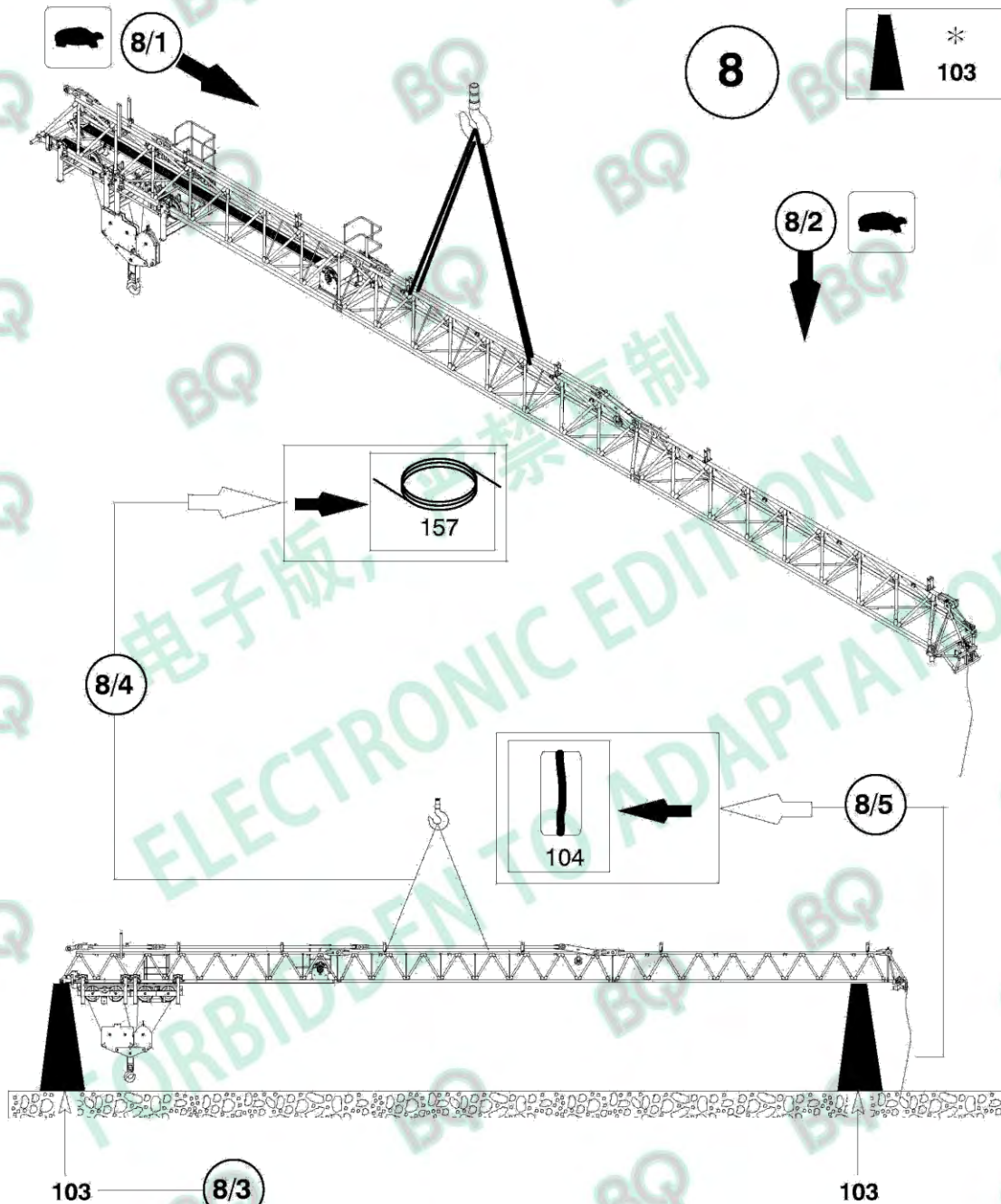
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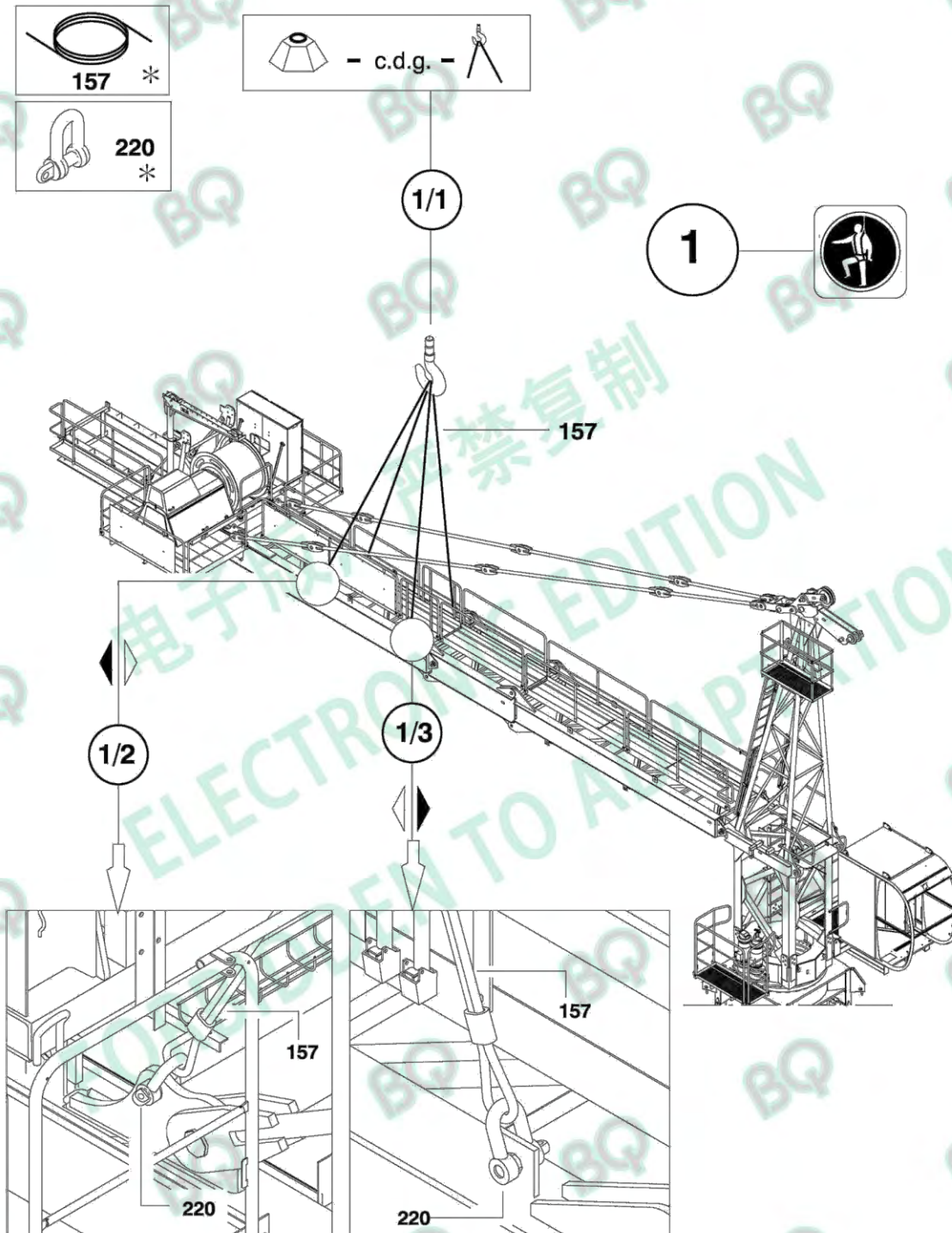
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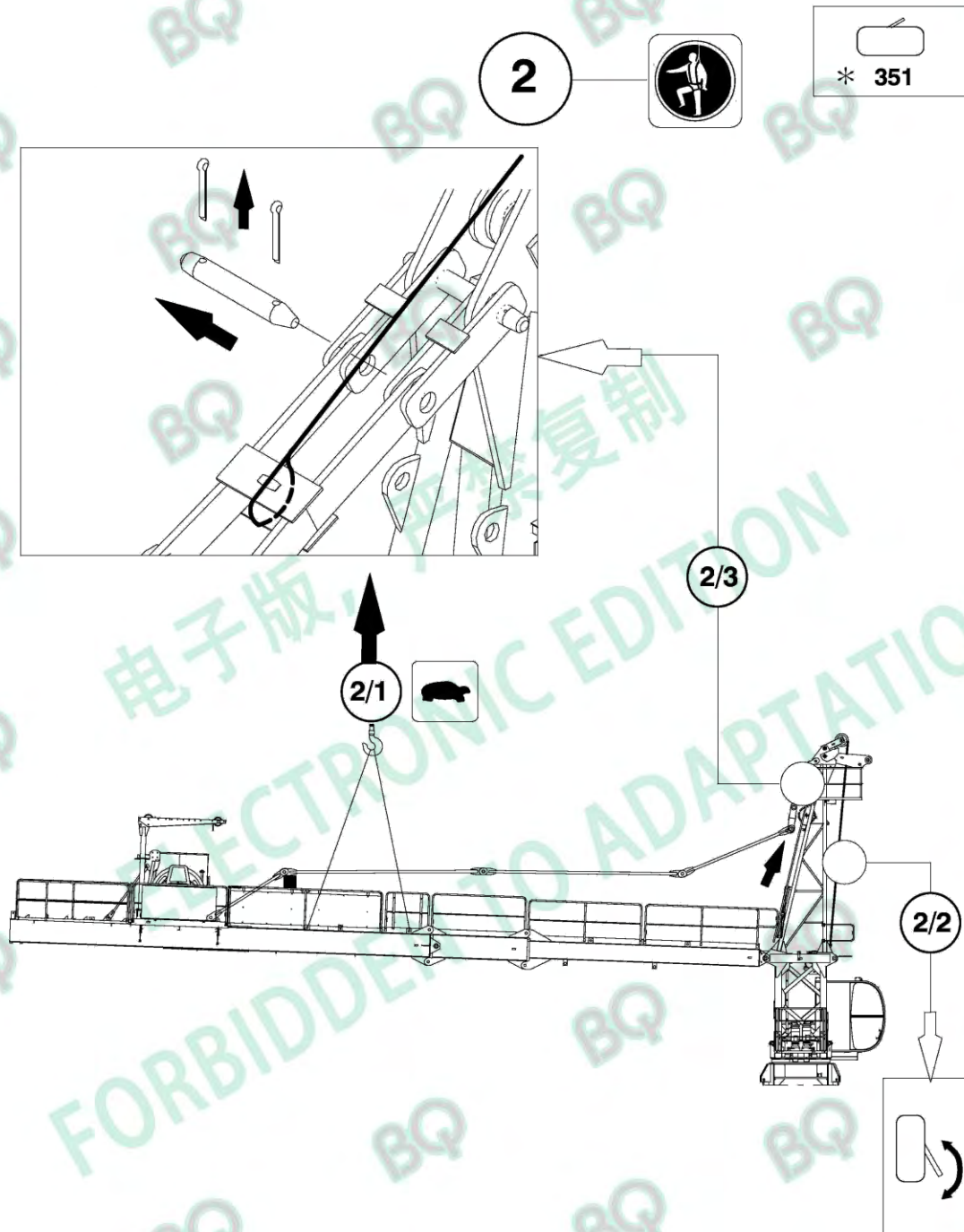


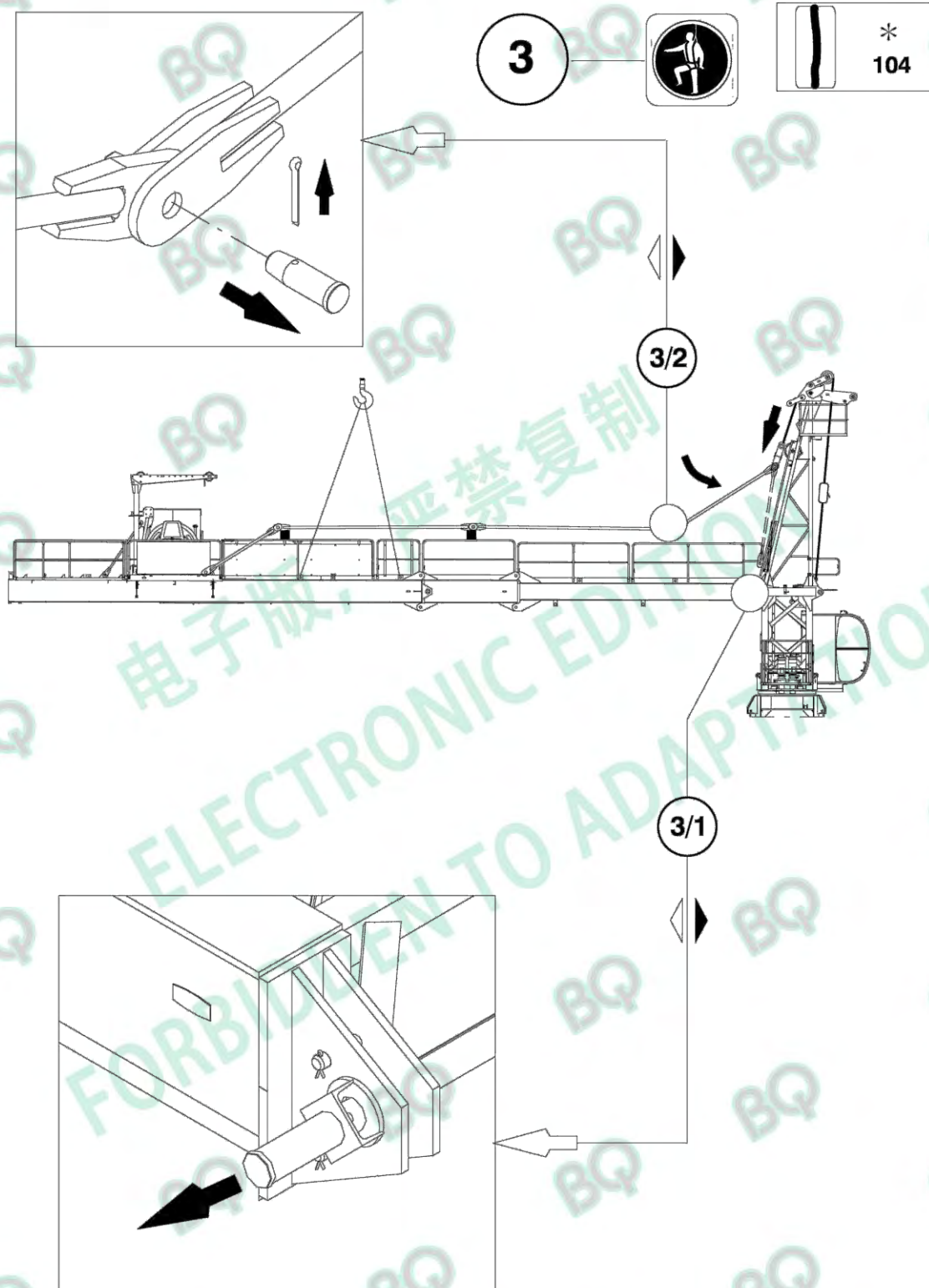
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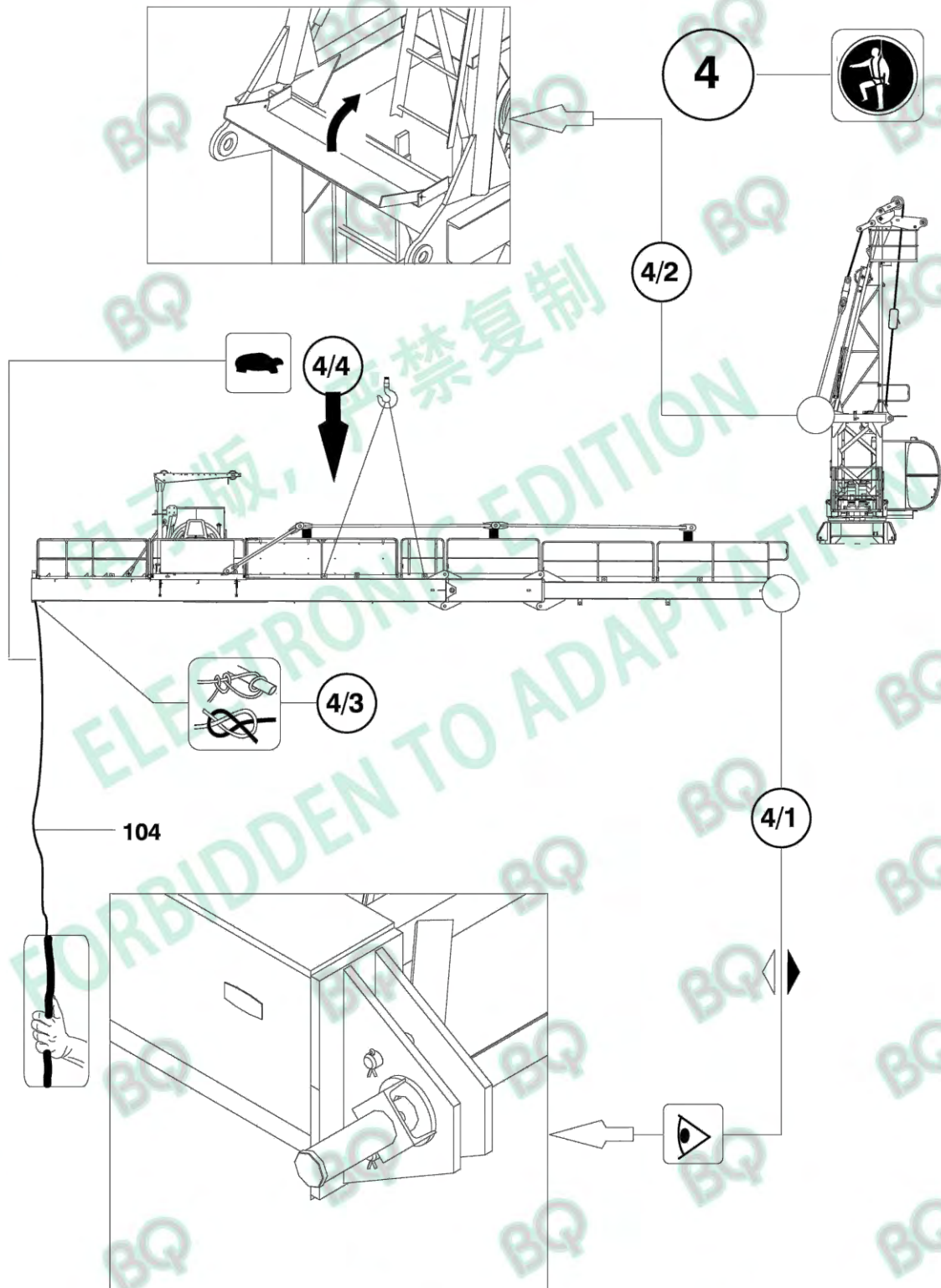


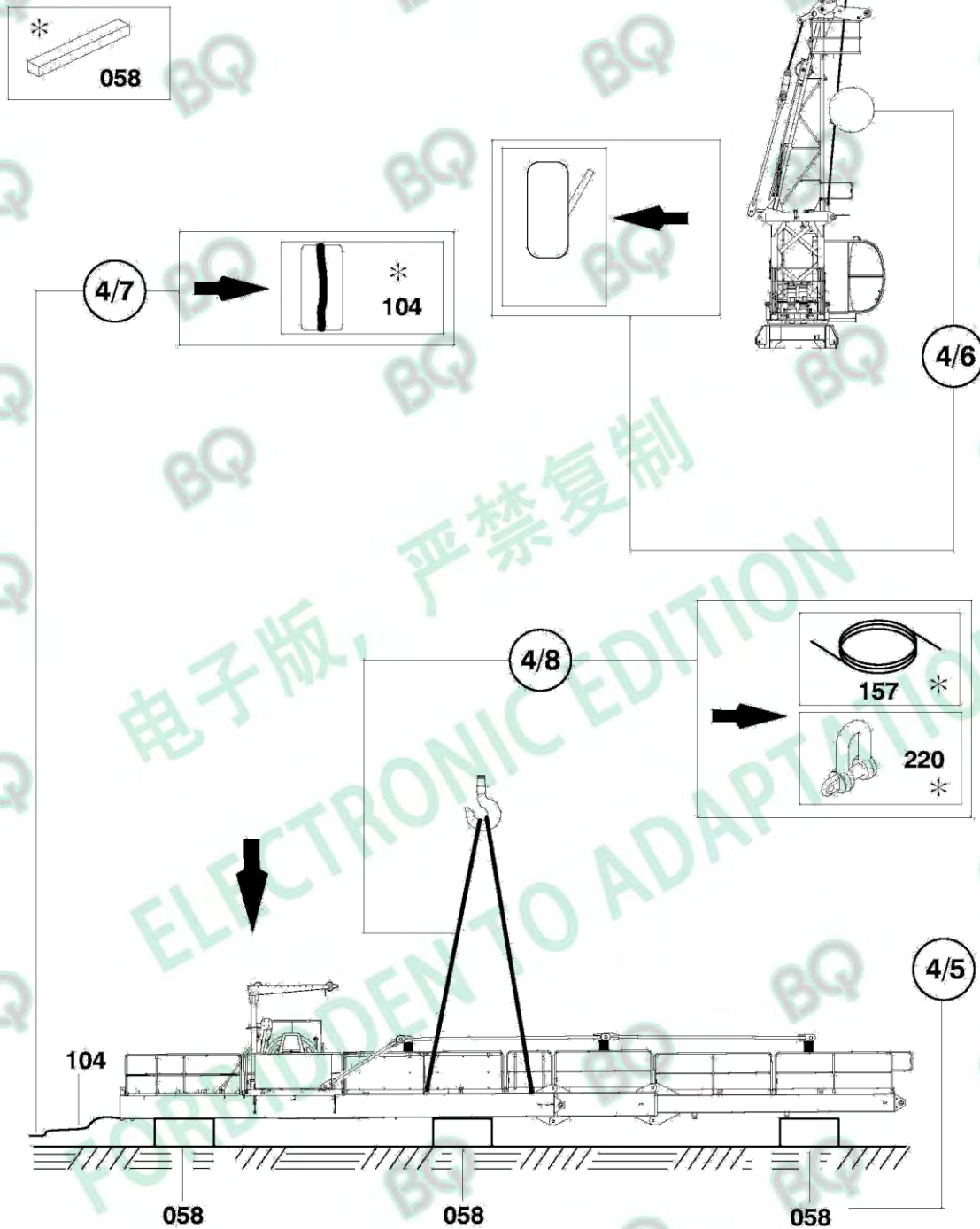
8. Disassembly of Balance Arm



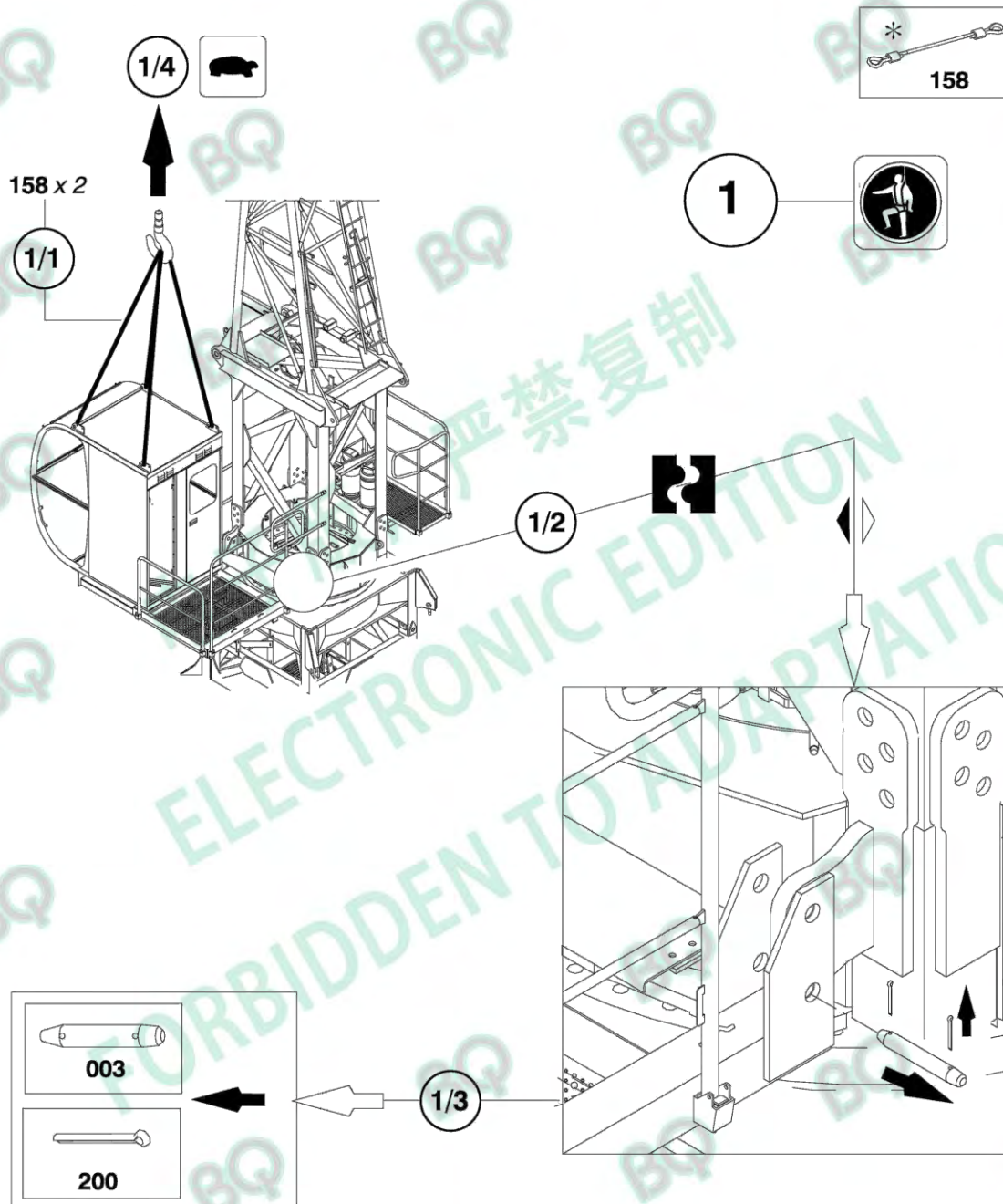


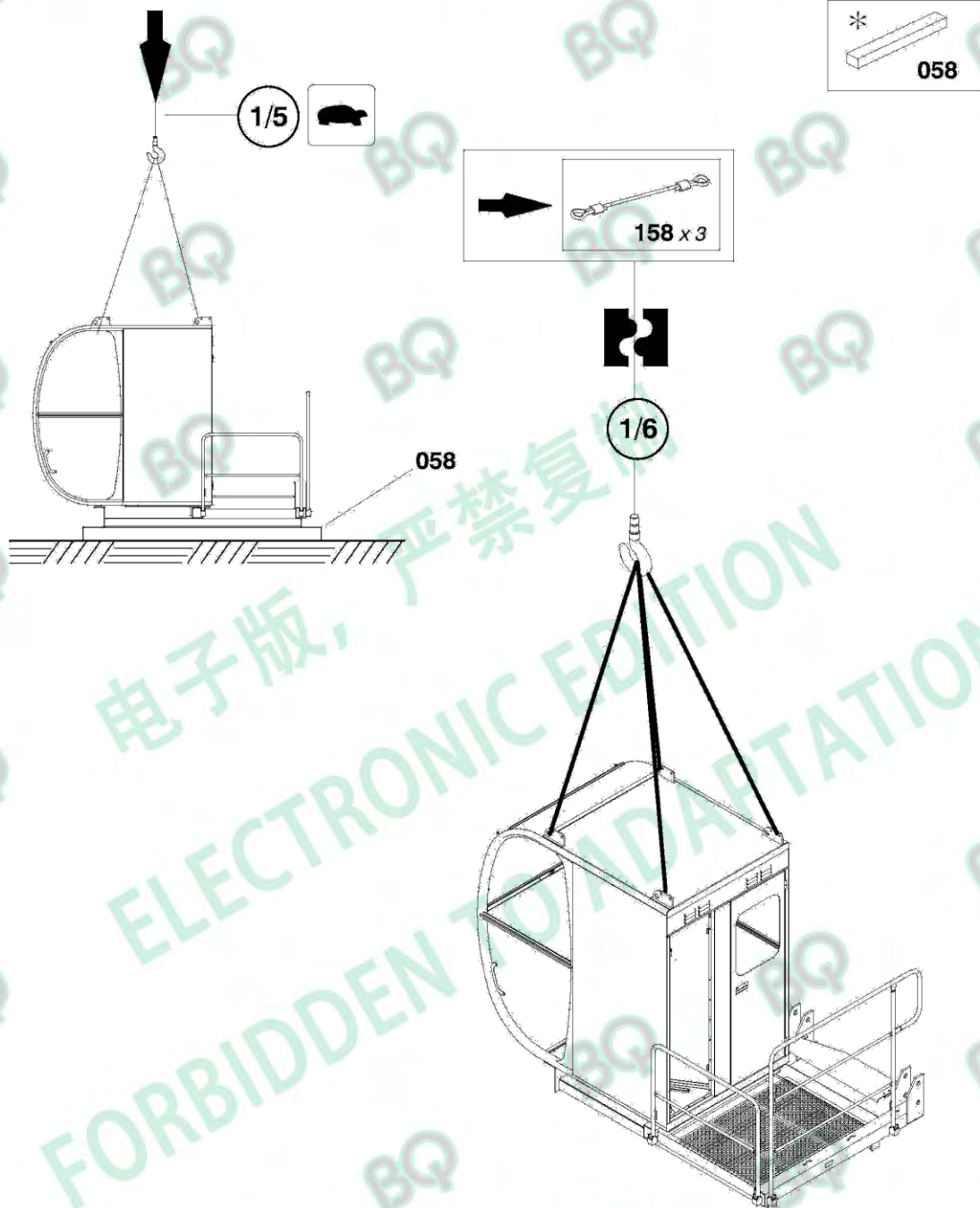




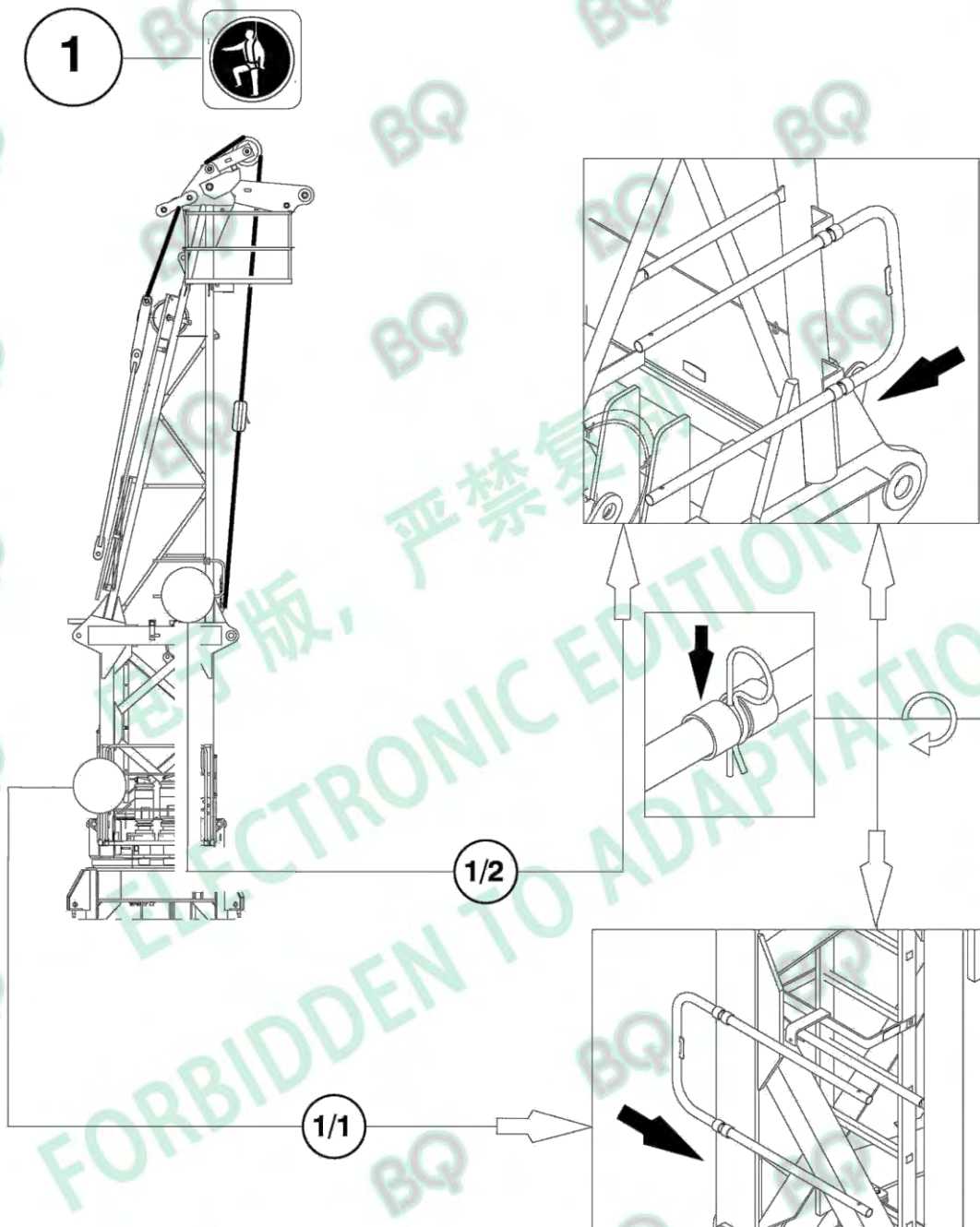


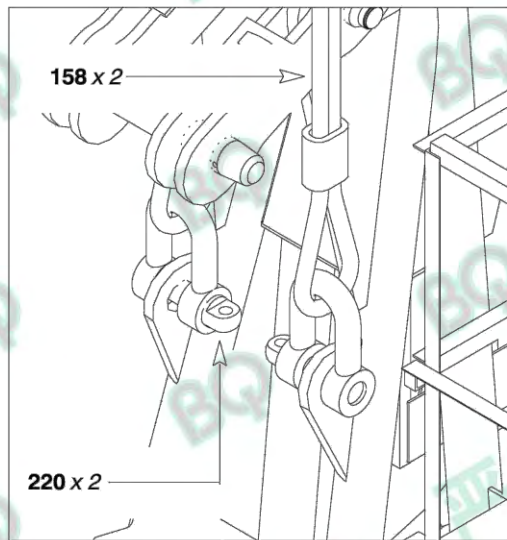
9. Disassembly of Cab



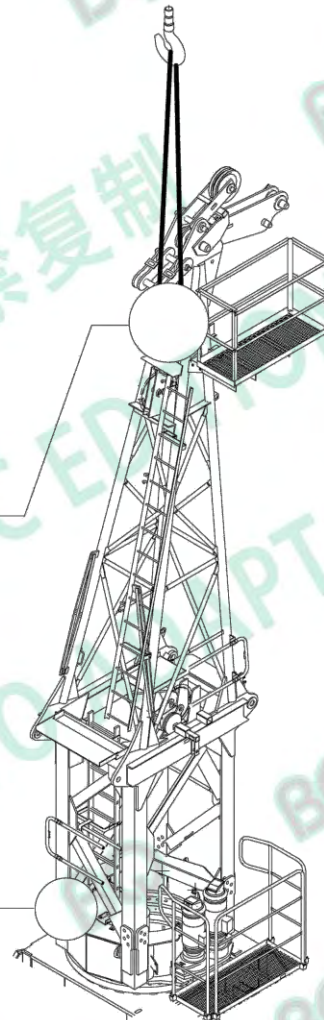
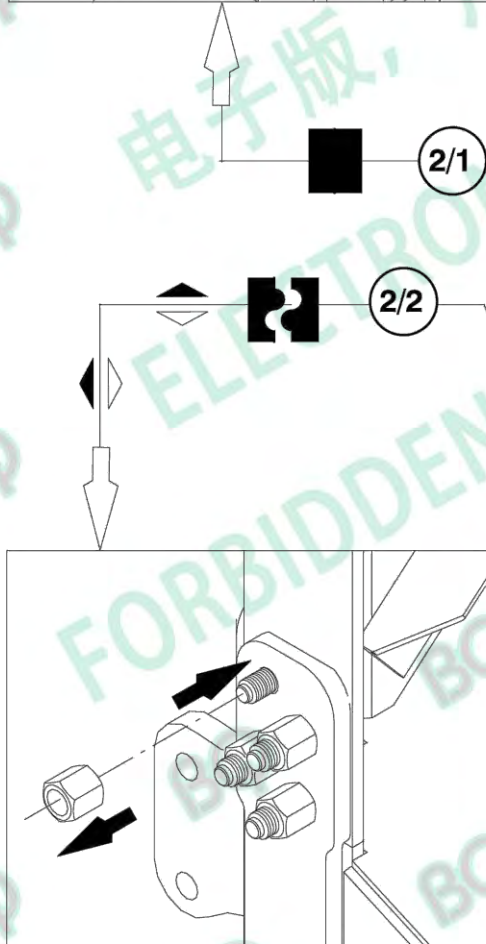
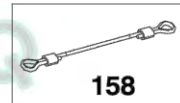


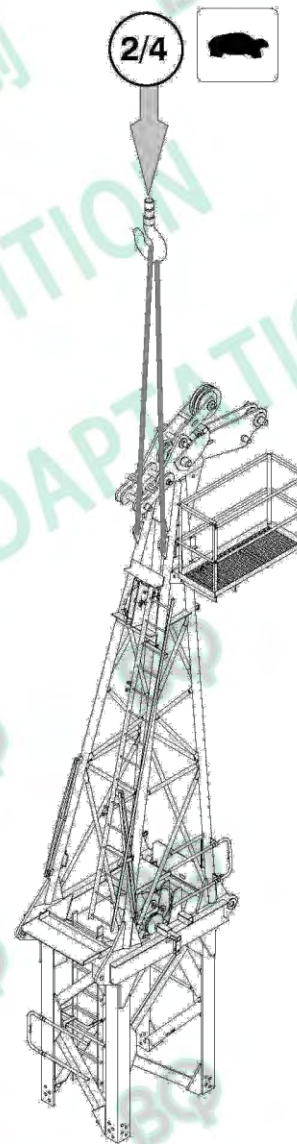
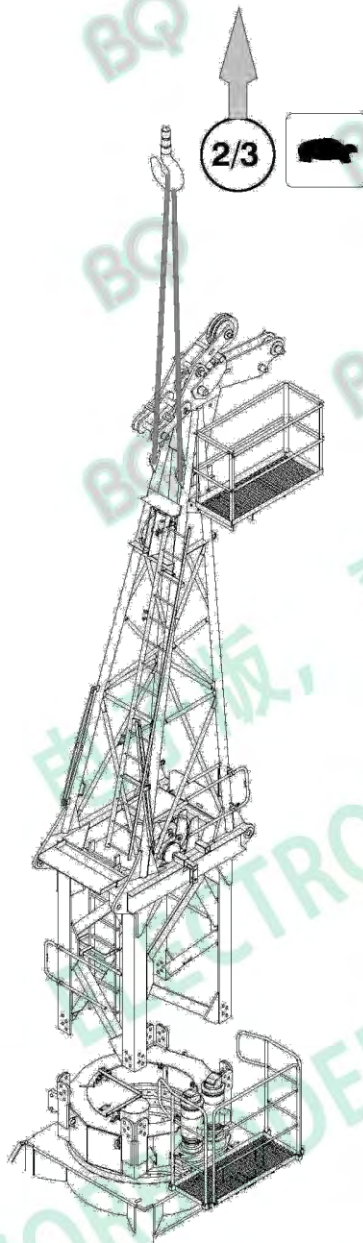
10 Disassembly of Tower Cap

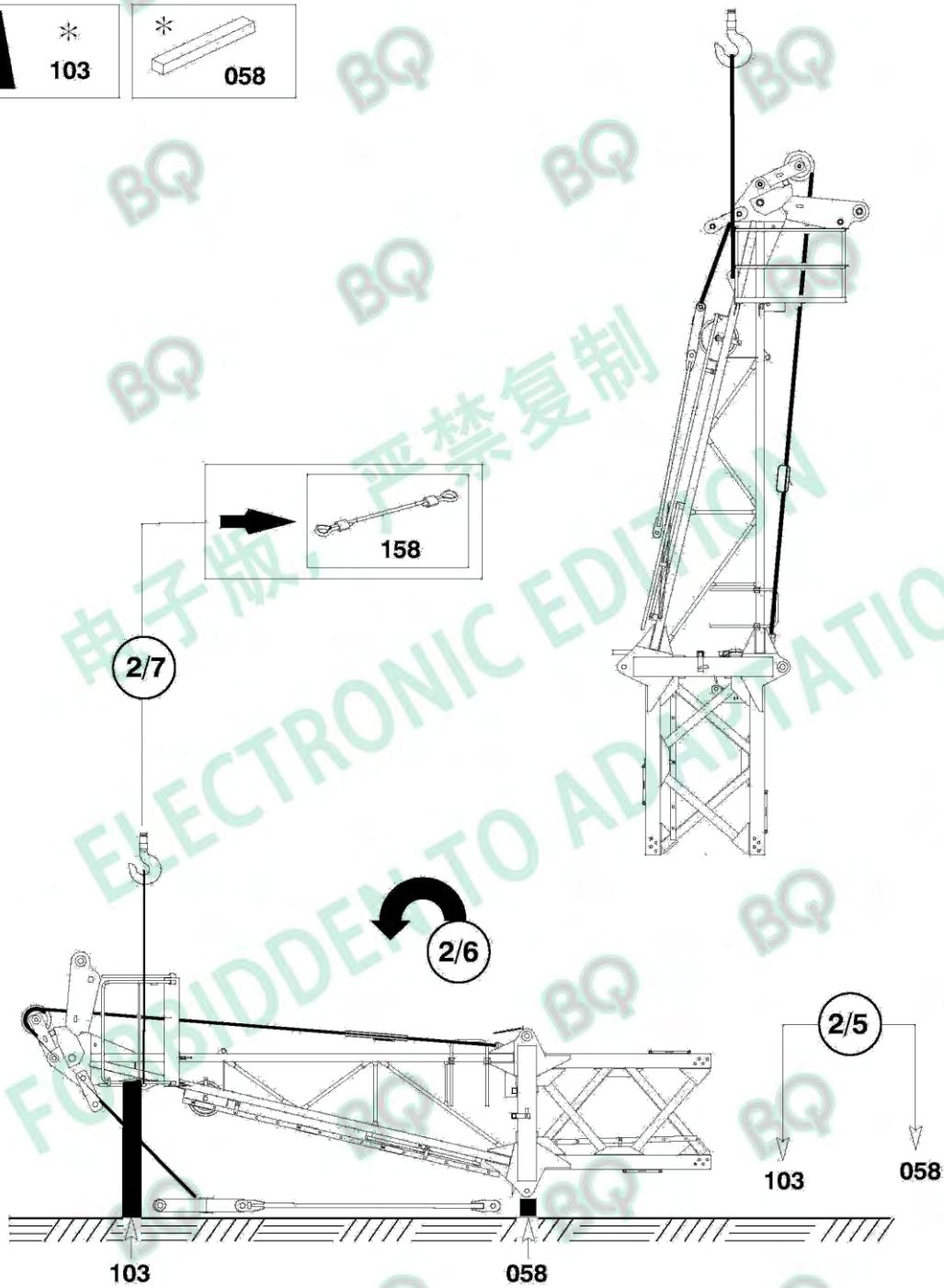
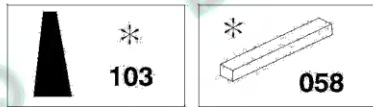




2



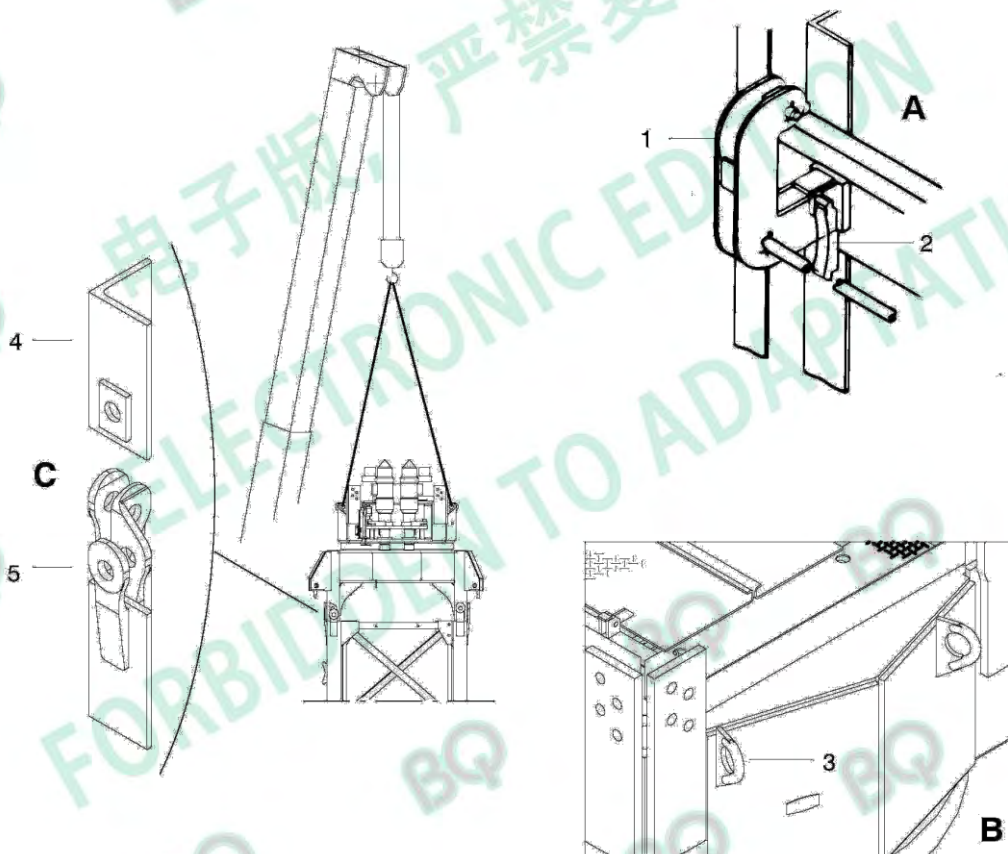




11. Disassembly of Slewing Mechanism

Note: If disassembly of swing mechanism is carried out after the mast section is removed, it shall hang the jacking frame with sling, pull out the shaft pin connecting the frame and the support and make frame climbing claw (1) fall on jacking step (2) (see Fig. A).

- Make the sling penetrate into front and back sling rings (3) of the upper support.
- Pull out the connection shaft pin.
- Hoist till lower support leg (4) breaks away from fishplate (5) of lower power body section (see Fig.C) and put the rotation mechanism on ground.



12 Disassembly of Tower Body

There are two situations:

- It shall be carried out after the mast section is removed.
 - Penetrate the sling into the upper connection plate ring of frame, hoist the frame and pull out it from its basic section and put it on ground.
 - Penetrate the sling ring into the fishplate shaft pin of basic section.
 - Remove the ladder lengthening part of chassis section.
 - Pull out the shaft pin between the chassis and the basic section, hoist the basic section and put it on ground.
- It shall be carried out after using the hoisting equipment for whole disassembly.
 - Place the sling ring at the fishplate shaft bin of two body top mast section.
 - Pull out the shaft pin between the hoisted mast section and the lower mast section, hoist the mast section and put it on ground.
 - Totally remove the tower body mast section till the basic section according to the aforementioned methods.
 - Place the sling ring at the fishplate shaft pin of basic section.
 - For the tower crane with chassis, remove the ladder lengthening part on the chassis section.
 - Pull out the basic section from the chassis or the fixed leg, hoist and put it on ground.

13. Disassembly of Chassis and Travelling Mechanism

- Clamp the trolley to the rail
- Remove tower crane weights
- Take down the channel and the cable drum
- Penetrate the sling into the chassis to make it break away from each connection pieces, hoist and put it on ground.
- Remove the inclined strut
- Pull out the shaft pin on the underframe and remove the underframe.
- Penetrate the sling into the trolley, release the rail clamping device to hoist and store it.